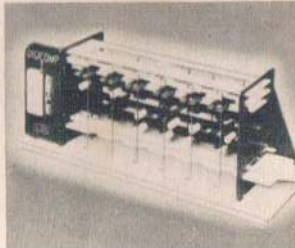


EDMUND Catalog

NUMBER 681

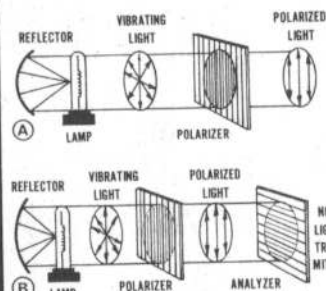
SCIENCE • MATH • OPTICS
for Hobbists, Schools, Industry
More than 4,000 Unusual Bargains

BE SURE TO SAVE • VALUABLE FUTURE REFERENCE



SPECIAL SALE! BUY WHILE IT LASTS**OPTICAL QUALITY POLARIZING MATERIAL****MANUFACTURER'S SELECTED SECONDS OFFERED AT BARGAIN PRICES****POLARIZED LIGHT**

Light, coming from a lamp, vibrates in all directions. A reflector, placed behind it, gives light direction (beam), but it still vibrates at right angles to the direction of the beam. A piece of polarizing material (polarizer) in the path of the beam acts like the slots in a Venetian blind. It causes the light to vibrate in only one direction—See Figure A.



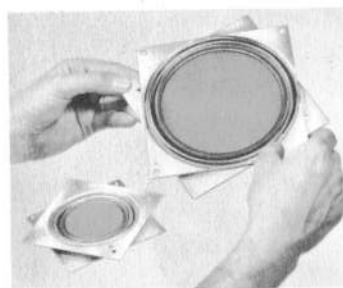
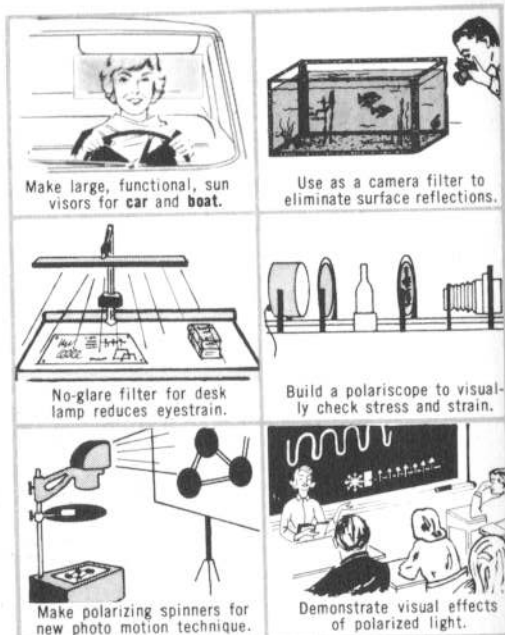
In the light-beam place a second piece of polarizing material (analyzer), with its axis (Venetian blind slots) at right angles to the polarizer. Very little light is transmitted—See Figure B. Changing the angle between the polarizer and analyzer transmits more or less light... the principle behind variable density filters.

POLARIZING MATERIAL

Approx. Size	No. of Sheets	Stock Number	Price Ppd.
6" x 24"	1	70,887	\$4.00
6" x 24"	2	P-70,888	7.00
6" x 24"	10	P-70,889	30.00
6" x 12"	2	P-70,890	3.00
6" x 6"	4	P-60,637	2.50
6" x 6"	50	P-70,891	25.00
6" diam.	2 discs	P-60,638	\$3.00
3 3/4"	2 discs	P-40,990	1.75

THE STORY: These large sheets of polarizing material were made specifically for the optical industry. The manufacturer who made them maintains very high quality standards. Whenever defects, even minute ones, appear in any portion of a sheet, the entire piece is rejected. Thus, these are rejects, because of very minor imperfections, which we can offer at a fraction of their normal price.

The polarizing material is sandwiched between two clear sheets of butyrate plastic. It is rigid, easily cut with scissors, measures .030" thick. Transmission is approximately 30% for a single sheet, approx. 22% for two sheets placed one on top of the other. When crossed, transmission falls below 1%. Resistant to fading and delamination, this material has dozens of uses and applications: no glare camera filters, pull-down auto visors, large photographic light filters, polarized light for microscopy, polariscopes, etc.

**VARIABLE DENSITY FILTERS IN METAL BALL BEARING MOUNTS**

Control light transmission from a given source with these heavy duty variable density filters (illustrated at left). Excellent for industrial production, test bench, experimental laboratory. Mounts built from heavy gage zinc-plated steel have deep races filled with balls. Transmission approx. 22%, less than 1% with 90° rotation. Will rotate 360°. Offset holes drilled in both sides for easy mounting. Instructions.

Size	Thick	Clear Aperture	Approx. Trans.	Stock Number	Price Ppd.
6" square	3/16"	4 3/4"	22% to 1%	40,992	\$6.00
4" square	3/16"	2 1/4"	22% to 1%	40,991	4.00

Add motion to your transparencies. See New Photo Motion Kits, pg. 114

1968 is Edmund's 26th year of successful operation and growth. A big "thank you" to all of our customers who have made it possible. The decision to "shop the Edmund Catalog first" is still a sound and economical one. You have our assurance, Edmund will continue to maintain its original objectives to offer excellent value at bargain prices, ship promptly, be sure you are satisfied.

NORMAN W. EDMUND, President
(Recipient of the 1967 Astronomical League Award "for outstanding service to the field of amateur astronomy").



AMERICA'S MARKET PLACE FOR THE SCIENCE MINDED



Present inventory exceeds 4,000 different items, and it continues to grow. Hobbyists and experimenters of all kinds, schools, universities, industrial laboratories and industrial giants such as RCA, General Electric, General Motors, Philco, and Boeing constantly purchase from us.

We carry items that are in great demand, plus unusual and hard-to-find products. Industrial buyers find our catalog a gold mine. It includes magnets, magnifiers, fiber optics, instruments, disposable knives, etc. Unusual presentation gifts for a retiring official or employee are the Spilhaus Space Clock and Fiber Optic Light Trees. Math, science teaching materials, optics for schools; crystal growing kits, miniature motors and gear trains for your son; Psychodelic and science jewelry for the ladies... all are listed in this catalog.

EARLY YEARS ESTABLISHED REPUTATION FOR BARGAINS

During the early years, Edmund Scientific Co. sold large quantities of war surplus optics and optical equipment. Because prices were low and values high, the business grew. The Company's reputation for honesty and fair dealing grew along with it. We still carry one of the largest stocks of war surplus optical parts, plus imported and industrial optical bargains.

EDMUND DESIGNS, MANUFACTURES AND IMPORTS

Throughout the years Edmund Scientific Co. has designed and manufactured many items, including Binoculars, Stereo Microscopes and Astronomical Telescopes. The most recent and widely acclaimed productions are Fiber Optic Light Trees (page 12) and The Spilhaus Space Clock (page 117). Other Edmund exclusives are Plastic Fiber Optics Light Guides, a selection of a laser-produced Holograms, Experiment Kits and Lande-Edmund Molecular Models. We continually produce new items and search the world's markets for scientifically useful products to meet your needs.

SATISFACTION GUARANTEED OR YOUR MONEY BACK

Edmund Scientific Co. avoids all exaggerated claims and never knowingly misrepresents merchandise in any way. We attempt to describe each item in the catalog with accuracy, just as you would describe it to your friends.

OUR GUARANTEE. If you are not completely satisfied, return the merchandise within 10 days... and we will gladly refund your money in full.

IT IS EASY AND THRIFTY TO BUY FROM EDMUND

The enclosed Edmund order form is convenient and easy to use. No postal calculations necessary because we pay postage on most items. The few exceptions are clearly marked Transportation Charges Collect. Simply jot down stock no., price and quantity of items you want. **NO MIDDLEMAN'S COMMISSIONS TO INFLATE PRICES, NO SALESMAN WILL CALL TO ANNOY YOU.** You eliminate visits to different retail stores and auto parking problems.

BROWSE THROUGH THE CATALOG AT YOUR LEISURE AND ORDER DIRECT FROM YOUR HOME, CLASSROOM OR OFFICE AS EASILY AS YOU MAIL A LETTER.

DON'T DELAY... ORDER NOW... FAST SERVICE

See page 4 for full information on **HOW TO ORDER** in the U.S.A. and abroad, minimum order policies, C.O.D.'s, etc.; how to get new up-to-date catalogs.

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HOW TO ORDER

FOLLOW THESE EASY STEPS FOR PROMPT SERVICE

1. **EDMUND'S MAILING ADDRESS.** Please use the one shown on the back cover of this catalog.
2. **USE CONVENIENT ORDER BLANK.** One accompanies your catalog. Include name, present address, and postal money order or check.
3. **DON'T FORGET ZIP CODE.** It helps the Post Office to give you faster service.
4. **POSTAGE.** Edmund pays it on most items except those marked "Transportation Charges Collect". On these you pay transportation costs on receipt of merchandise.

You Will Receive Your Orders Promptly. Our shipping department is organized to get your order out promptly. For faster service, most people find that sending their order by air mail meets their needs.

Telephone orders are taken, if necessary, from 8:00 A.M. to 4:30 P.M., Eastern Time, Monday through Friday. Call Area Code 609-547-3488 . . . no collect calls if you please.

Always Use The Same Name When Ordering. Include Initials.

If You Wish To Pay C.O.D. you can avoid delays on rush orders. C.O.D. orders must amount to \$5.00 or over. You pay both postage and charges on C.O.D. orders.

Minimum Order \$2.00 When Accompanied By Payment

Minimum Order On Open Account to well-rated firms, educational institutions, etc. is \$10.00. To save time orders under \$10.00 will be processed, but a \$3.00 service charge will be added. All open account orders must be properly signed; if confirming please mark as such. Our terms on open account orders are net 30 days. To establish credit send one bank and two commercial references, unless you are well rated in Dun and Bradstreet. Our Dun and Bradstreet number is 233-3870.

For Special Shipping Requests such as air parcel post, special delivery, etc., be sure to include the full amount of these costs. We will refund any overage. Companies and institutions should authorize us on their purchase orders to invoice for these.

Inquiries. If you have any questions about products in this catalog, please list them on a separate sheet of paper and mail together with your order. Do not make inquiries on order forms. It slows down replies.

Exchanges Or Refunds. Materials may be returned if not satisfactory. No permission is required. We do ask that merchandise be sent back within 10 days in the same condition as received. Be sure to include original order papers.

Canada & Mexico. We welcome orders from our friends across the borders. Both Minimum Orders and Open Account Orders will be accepted as outlined above. Orders from Mexico for \$16.00 and over must be accompanied by export papers. **Prices are in U.S. dollars.** Add 5% to the value of your order for extra postage, handling, etc. No postage stamps please.

Foreign Countries Other Than Canada and Mexico.

Address overseas foreign inquiries and orders, (U.S. possessions excluded) to: Sigma International, Inc., 13A East 40th Street, New York, New York 10016 (U.S.A.) English not necessary. Minimum order \$25.00. On orders under \$100.00 there is a surcharge of \$7.50 for preparation of export papers. Prices are F.O.B. factory; and shipping charges are based on dollar value of order. Write before ordering requesting total amount due, including shipping. Remittance, made payable to Sigma International, Inc., must accompany order. UNESCO coupons accepted.

KEEP THE EDMUND CATALOG COMING TO YOUR ADDRESS

We continually revise the Edmund Catalog, add new products, improve our regular products. **We will gladly send you or a friend a FREE CATALOG anytime . . . just write us.** Edmund customers receive new catalogs each year . . . one of the reasons we ask you to use the same name every time you order. It helps us to keep your name on one of our active mailing lists below. If you prefer your name on any particular list, please specify on order.

• List No. 1 INDIVIDUALS AT THEIR HOMES



Customers whose names appear on this list receive our catalog each Oct.-Nov. Be sure to notify us if you move, so we may keep your address current.

• List No. 2 INDIVIDUALS AT COMPANIES



Many individuals in industry specify Edmund materials and receive 3 or 4 catalog issues at work each year. If you desire this service, ask us to place your name on List #2.

• List No. 3 INDIVIDUALS AT SCHOOL



We mail to this list several times each year. Your name on this list assures that you, the teacher, rather than the school, receive the Edmund Catalogs.

• List No. 4 INDUSTRY AND GOVERNMENT



These are company and government agencies. To them we usually send 3 or 4 mailings per year.

• List No. 5 SCHOOLS AND COLLEGES



Like List No. 4 above, List No. 5 contains only the institutional name and address. All names receive our catalog issued in the fall, and any revisions made in it throughout the year.

THE EDMUND SCIENTIFIC CO.

Guarantee

Complete satisfaction or your money back. If you are not completely satisfied with anything you buy from Edmund Scientific Co., return the merchandise prepaid within 10 days, and we will gladly refund your full purchase price.

WE STILL PAY POSTAGE ON MOST ITEMS

IT'S NEW! DIGICOMP II

SENSATIONAL! FIRST MODEL DIGITAL COMPUTER DESIGNED FOR PROGRAMMING



- Automatic Switch Action
- Demonstrates "New" Math in Modern Way
- Instructive, Action-Fun for All Ages
- No Power or Batteries Required

It's here, the new advanced model of our "Working Model Digital Computer" (page 37) and exactly what you have been waiting for. It's more fun, offers a greater challenge and the first mechanical computer with automatic switch action. Now you can easily understand binary numbers and logic pattern theory.

This new computer, designed for programming, actually works like an electronic digital computer. Automatically solves real problems... adds, subtracts, multiplies, divides, memorizes. Instead of an electronic power source, Digicomp II uses the force of gravity to activate the movements of its flip-flops. Computer speed has been reduced by a factor of one million to one which enables you to see what is happening as it occurs. This, together with its other excellent features, makes Digicomp II the most perfect way to learn about computers.

A knowledge that is invaluable to future success in this increasingly computerized age.

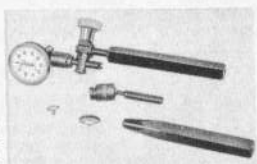
You automatically go from one operation to another by merely flipping switches. Pivoted levers act as the flip-flops of an electronic computer. Has 4-unit (bit) memory register, 3-unit multiplier-quotient register, 7-unit accumulator register, overflow switch and many other modern features that help to demonstrate the "new" math and computer use of binary numbers. Can also be used manually to further slacken speed in demonstrations. 14" wide x 29" long x 2" deep. Fold-away stand gives 14" incline. Made of red and white, sturdy plastic and Masonite. Includes comprehensive, illustrated instruction manual. Ready for shipment approx. Nov. 15, 1967.

No. 70,946 \$16.00 Postpaid

PRECISION DIAL TEST INDICATOR

Adjustable, 1"-Diameter Dial Reads Clockwise From 0-100 in .001" Graduations

Accurate measuring tool with accessories for mechanics, machine shops, home workshops, where measurements to .001" are required. Sturdily built, set includes 1", eccentrically mounted, dial indicator; $\frac{3}{16}$ ", $\frac{1}{8}$ ", $\frac{1}{4}$ " rounded contact points; tool post holder with fixed pin and adjustable clamp; additional tool post holder with swivel pin and ball-jointed pin. Range 0-0.125". Black finish, cased.



No. 60,674 \$15.50 Ppd.

NEW! SPACE AGE BLANKETS



Developed from strong but lightweight, superinsulated material that's spacecraft proven. They return 80% of user's body-heat. No equal for warmth and protection from sun and foul weather or as a suntanning aid. Perfect for sportsmen, travellers, etc. Just the thing for the car, beach, picnic, stadium games, etc. Waterproof

and windproof. Won't crack, mildew or rot. 39" x 56" Space Blanket. Bound edges. Weighs 5 1/2 oz.

No. 70,885 \$4.98 Postpaid

56" x 84" Space Blanket. Bound edges with grommets at corners. Wt. 11 oz. Reusable plastic pouch.

No. 70,886 \$7.95 Postpaid

(C) EMERGENCY SPACE-BLANKET (DISPOSABLE)

Similar to above, but foil-thin. Measures 56" x 86", folds to shirt pocket size. Flexible at 60° below zero. Metallic aluminized surface reflects 90% body heat (excellent light reflector for photographers). Weighs 2 oz. in plastic pocket case.

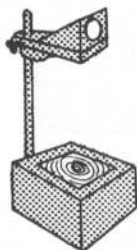
No. 60,636 \$2.00 ppd.

CONSTRUCT A BIG 10" X 10" OVERHEAD PROJECTOR ... FOR LESS THAN \$40.00

Why pay \$150.00 for one? Build your own with Edmund's New Overhead Projector Optics Kit. The secret lies in selecting the right optics. Edmund's kit contains the following matched elements: double Fresnel condenser (plastic) 11 1/8" x 11 1/8", 5 1/2" F.L.; two 88mm. diam. meniscus lenses, 14" E.F.L., f/3.5; instructions.

No. 70,966 \$17.00 Ppd.

To complete your projector, you will also need scrap lumber, wire, plus these following low-cost Edmund items. 500-watt quartz iodine lamp **No. 40,779 7.95 Ppd.** Socket for above. **No. 40,781 1.50 Ppd.** Motor and 6" fan. **No. 60,689 3.95 Ppd.** 4" x 6" mirror. **No. 60,247 .60 Ppd.** Switch. **No. 75 .35 Ppd.** Reflector. **No. 566 .75 Ppd.**



OWN A REVOLVING BEACON LIGHT

Add sparkle to your home and special occasions with revolving, colored lights. This attractive, hanging beacon adds that special touch to halls, porches, garden parties, patios and pools. Dozens of business applications for store windows, restaurants, cocktail lounges, motels and hotel lobbies. Red, green, blue and amber acrylic Fresnel lenses revolve 360°. Sixty rainbow-effect color changes each minute. Weatherproof, designed for outdoor use. 10 3/4" high, 6" diameter case of gold, anodized aluminum. Will not rust or discolor. Beacon is driven by totally enclosed 110-115 volt AC, 60-cycle synchronous motor. 10 ft. cord and plug; 1000-hour, 25-watt bulb; hanging bracket incl. U.L. approved. Wt. 2 3/4 lb.

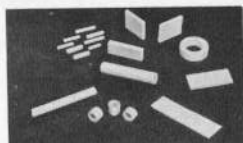


No. 80,100 \$26.00 Ppd.

INDOOR BEACON LIGHT. Similar to above but not weatherproof.

No. 80,099 \$21.00 Ppd.

LAST MINUTE NEW ITEMS



LOW-COST TEFLON ASSORTMENT

This is a hard-to-find Teflon assortment of manufacturer's "cut-normal market figure. Teflon, a most useful material, has hundreds of applications in the home, shop and industry. The variety of sizes and forms in this assortment gives you a versatility to experiment and make use of its smooth, anti-friction and water-resistant properties. Make miniature bearings; washers; sealer for pipe joints; weatherproofing; anti-friction material for drawers, windows and doors; special insulators; etc.

Assortment consists of blocks and both tubular and solid rods. Since these are manufacturer's cutoffs, dimensions will vary, but you get a minimum weight of 1 lb.

No. 70,967 \$6.00 Ppd.

UP TO 3,000 LIGHTS FROM 1 MATCH

Amazing Metal Match lights any fire you can start with a regular match. Easy to use even when wet! Will start camp fires; light charcoal, lanterns, canned heat, camp stoves, etc. Perfect for hunters, fishermen, ranchers, skiers, pilots, backyard chefs, etc. With a sharp object, scrape small particles off Metal Match onto tinder. Strong downward stroke produces spark which ignites particles. Your fire is started. Safe; won't ignite by itself. Doesn't leave marks on your hands or clothing. 2 1/2" long with 3/4" diameter. Belt chain and instructions included.

No. 41,056 \$2.49 Postpaid

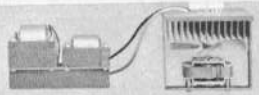


WATER THAT CLIMBS UPHILL

Did you see this experiment on TV? Add a small amount of Anti-gravity Friction reducing Additive to glass of water. Mix well. Spill some out into another glass and watch contents flow up and syphon into bottom container. To stop flow, cut with scissors. Watch it snap back. A dramatic demonstration that will amaze you and your friends. The secret is the additive's long molecular structure that reduces friction. Many industrial, agricultural and science fair applications. Water can be pumped further with less pumping pressure. A 3 oz. can makes 84 pints of elastic anti-gravity solution. 3 oz. can and instructions.

No. 41,086 \$2.00 Postpaid

NEW! LOW-COST THERMOELECTRIC COOLING SYSTEM



Save thousands of dollars in production of prototypes, mock-ups, models. Use it in appliances, instruments or industrial equipment for spot cooling. Ideal for custom cooling of chemicals, cold plates. Silent; no moving parts (except fan). No fluids to leak and corrode. At 80°F, capable of pumping 35 BTU/hr while maintaining transfer bar at 25°F! Cooling unit has 32-thermocouple, 15-amp. module between finned heatsink and aluminum transfer bar. 5 1/4" x 3 1/2" x 3". Power supply provides full-wave rectified DC from standard outlet.

Bismuth-telluride, semi-conductor blocks are connected in series and joined by a copper bridge. When DC is introduced, one side of solid state module cools, the other heats up. The cold quickly extends to transfer bar, while the heat flows into heatsink and is dissipated by fan. Two 6/32 tapped holes in transfer bar, 1" apart. Power input—110V, 60 cycle; approx. 1 amp. D.C. Consumption—3.4V, 12.5 amp.; ripple below 15%. Cooling Unit 4" x 5 1/8" x 5 1/2". Fan rpm—3100. Wt. 8 lbs. Instructions included.

No. 70,818 \$62.00 Postpaid



Reduce Costs & Errors, Save Time w/5-Digit Tally Registers

For years we have been using a high-speed "tally board" for recording inquiries. By mounting tally registers inexpensively and labeling each with the required code, one girl can quickly and efficiently

tally thousands of items.

Useful in all general offices, factories, schools, libraries, grocery and department stores, government agencies and hospitals. Tally food portions, inquiries, books, fines, inventories, sales, piece work, reasons for parts rejections, telephone calls, salesmen's calls and reports, complaints, traffic and many more.

Count from 0 to 9,999... most hand tally registers record only to 999. Mount as described, or use it with one hand for lab work, assembly lines, etc... slips on forefinger. Each time you depress button with thumb, one unit is added to total shown in clear plastic window. Knob returns count to 0 at any time. Rugged plastic case, 1 3/4" x 1 3/4" x 1 1/2"; no mounting holes or flanges—just cement to home-built frame. Imported.

No. 40,920 Each \$4.00 Ppd.

Quantities of 25 or more (specify).

Each \$3.20 Ppd.

GIANT 4 FT. BEACH BALL

Have fun in the sun and health-promoting exercise, all year long, with this huge, colorful, 4 ft. diam. beachball. Perfect for the pool, beach, backyard, vacations, etc. Kids and adults love them. Made of tough, embossed vinyl with 10 panels in 5 bright colors: red, blue, white, green and orange. When deflated easy to carry in beach bag. Inflate with air mattress or auto tire pump. Has carrying loop for convenient transportation or storage. Makes a wonderful prize... its size is truly impressive. Imported.

No. 60,667 \$6.00 Ppd.



NEW! GET DISTILLED WATER FOR ONLY 6c PER GALLON

Now, you and your family can drink pure, fresh water without worry. You'll discover a new flavor in coffee, tea, soups, mixed drinks, juice concentrates, etc. Pure water is a must for baby's formula and salt-free diets. Especially useful for



photographic chemical mixing and in experimental or industrial labs where distillate requirements are within the still's capacity. This new, low-priced water still transforms water, regardless of appearance, flavor or chemical composition, into pure distilled water that meets government specifications for only 6c per gallon. Removes rust, detergents, pesticides, chlorine, fluoride, alum, sulphur and other mineral impurities. Provides a supply of constant quality. Details of performance tests and distillate purity, available on request.

This compact, lightweight unit (only 6 lb.) vaporizes water in a Pyrex boiler and condenses vapor on inner surface of an aluminum-finned cover unit. The distillate collects and is channeled to a 1/2 gallon polyethylene receiving bottle. Silently and automatically produces 1/2 gallon of water in about 8 hours... 1 1/2-2 gallons in 24 hours. Uses only 3 kilowatts of electricity per gallon. No plumbing hook-up needed. Thermostat automatically shuts off unit when 1/2 gallon receiving-bottle is full. Red-light signals when distillation is completed. Plugs into 110 volt, 60-cycle outlet. Fully portable. Perfect for field-trips or areas where the water supply is questionable. Measures 13 1/2" high on 9 1/2" square base. U.L. approved. Complete still with two 1/2 gal. receiving bottles, instructions included.

No. 80,102 \$61.50 Ppd.

Zippered Carrying Case. **No. 70,908 \$6.75 Ppd.**

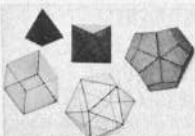
2 Extra, 1/2 gal. Bottles. **No. 70,906 \$6.50 Ppd.**

Replacement Pyrex Boiler.

No. 70,907 \$4.00 Ppd.

5 REGULAR POLYHEDRONS . . . EASY TO MAKE

A quick, new method for mathematical and molecular architecture. Set of 5 regular polyhedrons . . . tetrahedron, hexahedron (cube), octahedron, icosahedron and dodecahedron. Assembled in minutes from pre-formed, colored, transparent, tough plastic. Eliminates the old problem of cracking the plastic when folding. Set has Mylar strips which reinforce and serve as hinges for the folds. Sturdy; models last for years. Each measures 2.7" on edge except the 1.8" dodecahedron. Set includes 5 pre-formed, regular polyhedrons; Mylar strips; complete instructions and a 12-page, 3 1/2" x 4 1/4" booklet "The Five Regular Solids".



No. 60,672 \$4.95 Postpaid

Write for special prices on quantities of 100 or more models of tetrahedrons, octahedrons or cubes.

AUTOMATION COMES TO ART



Create colorful geometrical designs, automatically, with new Design-O-Graph set. Low-cost, motorized unit has a series of special gears and a calibrated arm which you set to produce an infinite number of geometrical patterns; circles, ellipses, epicyclic curves, etc. Use them in displays, wall decorations, etc. Draw on paper, wood, cloth, acetate, linoleum, etc. Operates on regular 110-120 volt A.C. current. Quiet. U.L. approved motor.

Set includes 6" x 18" x 18" Design-O-Graph; 8 different water color marking pens; supply of heavy, graphic art paper and instructions. Completely assembled except for 3 snap-in legs and screws.

No. 80,109 \$17.95 Postpaid

DRAW MILLIONS OF COLORFUL PATTERNS

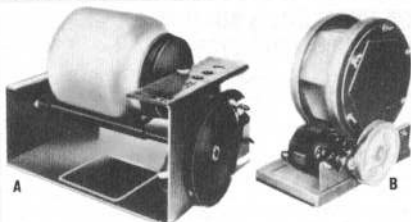
Creative fun for everyone. Make intricate geometrical patterns the first time with new Spirograph Set. Easy to use. Children love to draw patterns with Spirograph. Adults create colorful designs for Christmas cards, lampshades, embroidery, etc. Precision engineered parts "mesh" perfectly for smooth operation. Insert pen point, move the parts; a beautiful geometric pattern results. Set includes 22 different transparent, plastic wheels, rings and racks; 4 ball-point pens, red, blue, green and black; drawing board and paper; pins; storage tray and 16-page color illustrated, pattern and instruction booklet.

No. 70,905 \$4.00 Postpaid

NEW! BLACK LIGHT COATING FOR PICTURES

Gives pictures and photos a new, unusual dimension. Perfect for special effects and attention-getting displays. Coat with fluid and expose to black light. A light-blue overtone enhances and beautifies image. Easy to apply. Pictures will not streak. Not recommended for extra glossy photos, hand-painted or lithographed pictures. 4 oz. bottle. Instr.

No. 41,089 \$3.50 Postpaid



Low Cost Lapidary Tumblers

Few crafts offer the satisfaction of gem making—polishing inexpensive stones. Make jewelry of all kinds: earrings, bracelets, cuff links, tie clasps, as well as decorative book ends, table tops, ash trays, etc. Tumbling is an easy, inexpensive method. You just put a batch of stones in tumbler barrel with water and abrasives of decreasing coarseness, and let them tumble. Then mount on suitable jewelry findings with epoxy or similar adhesives.

(A) 3 Pound Capacity Lapidary Tumbler

Start gem polishing with a minimum investment. Heavy duty long life plastic barrel has screw type lid with neoprene gasket. Prevents leakage. Heavy gage steel frame, nylon barrel guide bearings. Continuous duty 115 Volt. A.C. motor, with belt reduction, drives barrel by friction. Cord and plug; overall 6" x 8 1/2" x 6" high. Instructions. Wt. 4 lb. **No. 70,874 \$10.75 Ppd.**

(B) 6 Pound Capacity Deluxe Lapidary Tumbler

This rugged, lapidary tumbler has 6-lb. (4 1/2-pt.) capacity. Fan-cooled, continuous duty motor that runs at 1550 RPM. Heavy steel barrel with 1/4"-thick, removable rubber liner—quiet, easy to clean. Neoprene gasket and warp-proof lid assure against leakage. Quiet, dependable V-belt drive, nylon bearings. Constructed of heavy gage steel; overall 6 1/2" x 12" x 12 1/2" high. Wt. 17 lbs.

No. 80,096 \$28.95 Postpaid

4-Step Polishing Grit Assortment. Includes 1/2 lb. coarse; 1/2 lb. medium; 1/2 lb. fine grit; and 6-oz. of polish which can be used 3 times. **No. 70,867 \$3.25 Ppd.**

6-lb. Rock Assortment. Ten different types: snowflake obsidian, optical quartz, turritella, lace agate, tigereye, rose quartz, agate, jasper, amethyst, green quartz. With finished step card . . . one identified polished rock of each type.

No. 70,868 \$9.00 Postpaid

TUMBLER'S GUIDE . . . R. J. Balej. A valuable 43 page manual on art and all phases of rock tumbling, 7" x 10", illustrated.

No. 9379 \$1.50 Ppd.

USEFUL NYLON & TEFLON BALL ASSORTMENTS

Nylon and Teflon centerless balls accurate to $\pm .001$. Use as check valves, relief valves, float valves in carburetors, toggle switches, lawn sprinklers, car transmissions, liquid filling machines; even light-load ball bearings. Non-corrosive, quiet running and self-lubricating. Assortment includes 38 pieces, 2 each, 19 different-sized balls as follows: 3/16", 1/8", 3/16", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1 1/8", 1 1/2", 1 3/4", 2", 2 1/2", 3", 3 1/2", 4", 4 1/2", 5", 5 1/2", 6", 6 1/2", 7", 7 1/2", 8", 9", 10", 11", 12", 14", 16", 18", 20", 22", 24", 26", 28", 30", 32", 34", 36", 38", 40", 42", 44", 46", 48", 50", 52", 54", 56", 58", 60", 62", 64", 66", 68", 70", 72", 74", 76", 78", 80", 82", 84", 86", 88", 90", 92", 94", 96", 98", 100". Weak acids and strong alkalis affect neither. Weak acids . . . Nylon is resistant, Teflon is not affected.

Type	Qty.	Rockwell Hardness	Temp°F	Stock No.	Price Ppd.
Nylon 38	R111-R118		270-300	60,683	\$16.50
Teflon 38	SHORE D50-D56		550	60,684	\$27.00



SOLAR PLANET DISPLAY BUILT TO SCALE

Unique decorative accessory and conversation piece. Shows relative size of all 9 planets in their order from the Sun. Planets scaled 1" to 60,000 miles, mounted in clear plastic ellipse scaled to Sun's diameter. Fine classroom visual aid. Measures 14 3/8" x 2 3/4" including base. Instruction. **No. 70,873 \$4.25 Postpaid**

COMPACT FLUORESCENT LIGHT UNIT



Gives a maximum amount of light, requires a minimum of space. Slim, flat, fits almost anywhere; under shelves, counters, cabinets in your den, study, kitchen, workshop or display case. Plugs into regular 120-volt, 60-cycle AC outlet. Has ridged-plastic light diffuser. Unit, mounted in white, baked enamel, metal case, has mounting holes and screws, cord, plug, plug-outlet and 18", 15-watt, fluorescent tube. Imported.

No. 70,945 \$8.00 Postpaid

Convert to Black Light, with our 18", 15-watt, black light bulb. **No. 60,126 \$6.75 Postpaid**

LAST MINUTE NEW ITEMS

NEW POWER DRIVES KIT WITH "TINY ATOM MOTOR"

Master the principles of power drives with Power Drives Kit. You actually build the "Tiny Atom Motor" and 7 types of power drives... flexible connection, pulleys and belts, pinion to pinion, pinion to cross gear, friction wheel, pinion to spur gear and worm to spur gear. An exciting concept in learning for ages 8-15. Demonstrate how different power drives reduce or quicken speeds of driven shafts.

Kit contains well over 50 parts—gears, pulleys, motor assembly, pulley belts, friction wheel, cord set, etc. Kit includes a 24-page, illustrated instruction manual. Batteries not included. **No. 70,939 \$10.00 Ppd.**



AUTOMATIC ELECTRIC EYE DIAPHRAGM



FRONT

BACK

Manufacturer's surplus. Ideal for demonstrating the operation of automatic aperture mechanisms. Aperture changes size according to the brightness of lighting conditions relayed by rectangular 1" x 1 3/4" selenium photocell. The diaphragm opening is almost square; side length varies from 1mm to 5mm, corresponding to light of 50 and .05 footcandles. Shifts from largest to smallest opening in approx. 1.5 seconds. Red warning flag indicates when lighting conditions are beyond unit's range. Black, plastic case, 3" wide x 3 3/4" high x 1 1/4" thick, with 2 mounting holes. Diaphragm plane is 3/4" below case's top surface and 3/4" above bottom surface. Selenium photocell has 3/4" square opening. Wt. 4 oz.

No. 60,673 \$3.95 Postpaid

LASER-PRODUCED SPECIAL COLOR FILTERS

Put unusual, abstract color patterns into your photos. These laser-produced filters split light, from any source, into an array of forms and rainbow colors. This results in multiple dispersal of images in the field of view. Spectacular results are obtained at night from street lights, neon signs, etc. Will also give interesting effects in daylight from sun reflections. Filters, mounted between 2 thin glass plates. Use with any camera. Most successful with single lens or twin lens reflex. Available in 3 different patterns and in 3 photo filter sizes. Instructions included. **\$4.50 Postpaid per pattern.**

Pattern	Series V (30mm)	Series VI (41mm)	Series VII (51mm)
Starburst	No. 30,610	No. 30,611	No. 41,097
Spiral	No. 30,612	No. 30,613	No. 41,098
Square	No. 30,614	No. 30,615	No. 41,099



NEW! "THE BEST MINIATURE PUMP WE'VE EVER TESTED" says Project Engineer.

Use this rugged miniature pump (non submersible) for displays, table fountains, waterfalls, aquariums, bird baths, etc. Even pumps mild chemicals. Place enamelled base in 1/2" to 2" of liquid. Continuous duty, 115-volt, 60 cycle A.C. Induction motor pumps 28 gallons per hour to height of 1 ft. or 11 gallons to 2 ft. Maximum head 3 ft. Motor performance at full load is 0.52 amp., 45 watts, 1850 rpm. Pre-lubricated, sintered, bronze bearings. Pump measures 2 1/2" x 4" high; has 3" lead wires (plug not incl.) and 1 1/2" x 1/4"—O.D. outlet tubing. Wt. 8 oz.

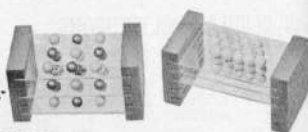
No. 60,607 \$9.50 Ppd.

SUBMERSIBLE A.C. PUMP... MAKE A FOUNTAIN OR USE IN LAB.

Add a creative touch to garden or patio. Be the envy of your neighborhood. Many industrial and laboratory applications for this submersible unit. Kit includes 170 G.P.H. non-rusting submersible pump, motor sealed in oil, filter screen, adjustable nozzle. 6" x 6" blue plastic liner, 70" x 3 wire cord and plug. Uses 110 volt A.C. Kit builds 4' pool with 2' head. Add decorations to suit surroundings. **No. 70,876 \$21.00 Ppd.**



TEACHERS! STUDENTS! MAKE CRYSTAL-MOLECULAR MODELS IN SECONDS



With this Crystal-Molecular Model Set, you can build almost any structure; from a simple water molecule to those of diamonds. Make structures of ethane, sulfuric acid, NaCl, acetylene, graphite, etc. Easy, quick, instructive... learn the theory much easier. Set consists of two 3" x 3" x 3/4", wooden support-blocks; ten 3" x 5" transparent plastic planes (corresponding to atomic planes) and 80 colored beads... red, green, black, and yellow. Create desired structures by placing colored beads (representing atoms) into the punch-holes of planes. You can make lattice and close-packed types. Instruction booklet containing numerous examples and exercises, handy storage box included.

No. 70,948 \$4.95 Ppd.

ATOMIC AND MOLECULAR ORBITAL MODEL SET



Tetrahedron



Trigonal Bipyramid



Octahedron

Assemble, on the spot, classroom-size, clear, plastic models. Students see the geometry of orbitals and chemical bonds. Demonstrate hundreds of different compounds. Shows how hybridization of atomic orbitals results in molecular orbitals and chemical compounds. Easily assembled from pre-folded, rigid plastic and Mylar strips. 4 models, 7" on edge, each with orbital planes... tetrahedron, illustrates sp³ hybrid orbitals; trigonal bipyramid, illustrates sp², dsp³ hybrids, etc.; 2 octahedrons (used singly, together or with s orbital) illustrate p, s, sp hybrids, etc. You also get removable, colored caps (red, blue, yellow, green, white and black) for representing atom combinations and groups; styrofoam s orbital; 3 metal stands (tetrahedron stands by itself) and instruction manual.

No. 70,947 \$15.95 Postpaid

WHAT'S THE WEATHER GOING TO BE?

A most attractive combination barometer-thermometer for desk or wall. 3 1/2" dial, graduated in 0.02" increments in a range from 27.90" to 31.10". Temperature is read in °F from lower, rotating dial. Brass finished case, ship's wheel design has appealing nautical flavor. Measures 5 1/4" overall. Instructions included. Imported.

No. 70,944 \$13.50 Postpaid



INSTRUMENT QUALITY, PLANE REFLECTION GRATING REPLICAS

These are replicas on aluminized glass blanks, reproduced from very high quality imported masters. The masters are ruled on an ultra-precision, interferometrically controlled ruling engine. Interferometric controls are the most modern and accurate, because they define grating spacing in terms of the wavelength of light.

The replicas are of good cosmetic appearance, well blazed, with resolution approaching the theoretical limit. They are of instrument quality, suitable for most instrument applications and very attractively priced. See availability of interferograms of the original gratings, as listed below.

Grooves per inch (approx.)			15,000 (600/mm)		15,000 (600/mm)		30,000 (1200/mm)		30,000 (1200/mm)	
Blaze Wave Length			4,000 Å		5,000 Å		2,400 Å		4,000 Å	
Size Inches	Groove Length	Ruled Width	Stock No.	Price Ppd.	Stock No.	Price Ppd.	Stock No.	Price Ppd.	Stock No.	Price Ppd.
1/2" x 1"	1/2"	1"	41,021	\$24.00	41,030	\$24.00	41,039	\$36.00	41,048	\$36.00
3/4" x 1"	3/4"	1"	41,020	28.00	41,029	28.00	41,038	42.00	41,047	42.00
1" x 1"	1"	1"	41,019	34.00	41,028	34.00	41,037	50.00	41,046	50.00
1" x 2"	1"	2"	41,018	39.00	41,027	39.00	41,036	58.00	41,045	58.00
1 1/2" x 2"	1 1/2"	2"	41,017	46.00	41,026	46.00	41,035	69.00	41,044	69.00
2" x 2"	2"	2"	41,016	60.00	41,025	60.00	41,034	90.00	41,043	90.00
2" x 4"	2"	4"	41,015	90.00	41,024	90.00	41,033	135.00	41,042	135.00
3" x 3"	3"	3"	41,014	120.00	41,023	120.00	41,032	180.00	41,041	180.00
4" x 4"	4"	4"	41,013	150.00	41,022	150.00	41,031	225.00	41,040	225.00

INTERFEROGRAMS

An interferogram is a photograph of the grating diffracted wavefront compared with the wavefront of a master flat mirror. It is an invaluable guide in determining any departures from linearity of grating spacing. Made from the original gratings. Above replicas are duplicates of the originals.

Grooves per inch	Angstrom	Stock No.	Price Ppd.
15,000 (600/mm)	4,000	41,102	\$1.75
15,000 (600/mm)	5,000	41,103	1.75
30,000 (1200/mm)	2,400	41,104	1.75
30,000 (1200/mm)	4,000	41,105	1.75

GOOD QUALITY TRANSMISSION AND REFLECTION REPLICATION GRATINGS

Primarily made for school, laboratories, their quality is sufficiently high for many industrial applications. Each is ruled 30,000 lines per inch on specially selected plastic and grating area measures approximately 7/8" x 1 1/8". In 2" x 3" mount.

Reflection Diffraction Grating as above No. 30,602 \$20.00. (Caution: Glass covers plastic plate on one side only. Ruled surface not protected).

Transmission Diffraction Grating as above No. 30,601 \$15.00 (both sides protected with glass cover plates).

MICRO-LITER COUNTING CELL



Transparent plastic slide with central cell (50 x 20 x 1mm) that contains exactly 1 milliliter in volume. Ruled in 1mm squares. Useful for water and

particle analysis, controlled inspection of culture growth, subdivision of a precise quantity of liquid, identifying areas of specimens, as a permanent slide for disposable specimens, etc. A versatile counting accessory for microscopes. 1" wide x 3" long x 0.11" thick. Includes cover glass. **No. 30,603 \$8.00 Ppd.**

PRECISION PINHOLES... 1, 10 and 25 MICRONS

Use to control apertures of light beams, laser beams, etc. Scientists find many uses for them in light experiments, research and development studies. Each pinhole is made in blackened, metal foil, mounted in a .625" diameter metal disc. Imported. 1 micron (± 0.5 micron)

No. 30,604 \$20.00 Ppd.

10 micron (± 1.0 micron)

No. 30,605 \$14.00 Ppd.

25 micron (± 1.0 micron)

No. 30,606 \$14.00 Ppd.

Metal Mounts for Pinholes. Convert pinholes listed above to 2" x 2" and 1" x 3". Mounts, .075" thick, have center holes tooled to accept the .625" diam. pinhole metal discs. Imported.

2" x 2" Metal Mount.

No. 30,607 \$2.00 Ppd.

1" x 3" Metal Mount.

No. 30,608 \$2.00 Ppd.

CALIBRATION SCALE, 30,000 LINES PER INCH

An extremely precise, 1/8" diam. grating ruled 30,000 lines per inch. Mounted on 100 mesh copper grid on collodion film, carbon stabilized. Shadow cast with platinum on one face of the grating 10° to 20°. Designed for calibration of electron microscopes or other instruments where a highly precise reference scale is required. Weight 4 oz., in plastic envelope. Instructions included. Imported. **No. 30,594 \$20.00 Ppd.**

ORIGINAL 1000-LINE METALIZED GRATING

Here's a high-quality, 1000 lines per inch, metalized grating in a 2" x 2" x .075" glass slide. Many uses, especially in Metrology and Microscopy. Has 50-50 ratio of black and clear parallel lines. One line per .001".

No. 30,609 \$54.00 Ppd.

Metalized Grating and Ronchi Rulings, Page 94

EXECUTIVE TRANQUILIZER

A "must" for the harried executive and anyone with nervous tension. Use this magnetic tranquilizer to relieve it. Test your executive I.Q. Try the four interesting applications given in the instruction sheet. Set includes 15 magnets; 6 gold colored rings and 9 core pieces. Everything attracts or repels depending on polarity of each piece.

Make core jump through rings or stay inside. A fine gift for Dad, Junior, or a youngster confined to bed. Attractively gift packed with miniature vinyl briefcase and instructions. **No. 60,630 \$3.00 Postpaid**



SALE! GLASS CAPILLARIES AT FRACTION OF NORMAL PRICE

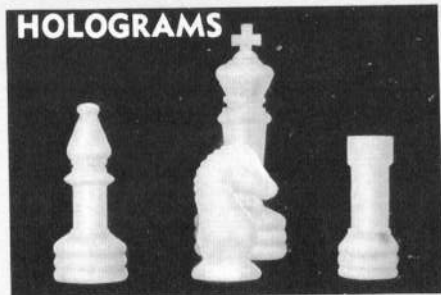
Slightly below original spec. These surplus glass capillaries, in assortments of 6, have highly polished, tapered (not stepped) bores accurate to ±.0001". Many uses especially where an exceptionally small orifice is required. sizes as below.

Stock No.	Bore Sizes	Sizes Labeled	Pkg. of 6 Price Ppd.
P-60,626	.0005" to .005"	No	\$ 5.00
P-60,627	.001" to .002"	No	6.00
P-60,628	.0005" to .005"	Yes	10.00
P-60,629	.001" to .002"	Yes	12.00



LAST MINUTE NEW ITEMS

HOLOGRAMS



FIRST AGAIN! NOW TRANSMISSION, REFLECTION, DOUBLE IMAGE & PROJECTED REAL IMAGE TYPES

You've probably been reading about **LASER-PRODUCED HOLOGRAMS**. Now, you can own one very inexpensively. See amazing 3-D images produced from a flat photographic film. Effectively demonstrates fascinating holographic principles.

ASTOUNDING, YET STILL IN ITS INFANCY

Holography, a relatively new science, is the forerunner of 3-D movies and 3-D television. It has been referred to as the "freezing of light waves." Transmission-type holograms, requiring thousands of dollars of equipment, are true 3-dimensional pictures taken by splitting a laser beam into two parts. One is reflected from a mirror onto a high-resolution, photographic recording plate; while the other is reflected from the subject onto the plate. Interference between the wavefronts of the two creates an image which exhibits incredible characteristics. When the recorded image is reconstructed, the subject is suspended in mid-air beyond or in front of the hologram and appears in true 3-D perspective. You can actually look around, over the top and underneath the subject and see all the details there! Amazing as it may seem, the entire scene is recorded everywhere on the plate, while at no spot exclusively. Cut the plate in half, each half still contains the full scene. This can be done repeatedly, many times. These amazing phenomena can be easily seen with our holograms. Demonstrate them to your friends.

VERY EASY TO SEE AND DEMONSTRATE

Reconstruct these holograms using a light source from a 35mm projector or a popular, high-intensity desk lamp and our included monochromatic filter. When you look through the hologram the images appear in 3-D against a dark background. Change your angle of view by moving your head and the images also change their perspective against the background. It's uncanny to see a 3-D picture, from whatever angle you view it, produced from a flat film or glass plate. Instructions are included for building viewing box and using 35mm projector as light source.

4 TYPES AVAILABLE . . . GET THEM TODAY

Transmission Type (pictured above) produces chessmen image beyond the hologram.

Projected Real Image Type. Dinosaur images are projected in front of the hologram.

Double Image Type. 2 images; dinosaurs and geometric shapes recorded on same film. View them separately by rotating hologram 180°.

Reflection Type. Place light source in front of hologram. Image of geometric shapes is reflected beyond hologram. Filter not required.

Type	Approx. size	Stock No.	Price Ppd.
Transmission-film	2 1/2" x 4"	41,090	\$ 4.50
Transmission-film	4" x 5"	40,969	11.00
Transmission-glass	4" x 5"	40,984	30.00
Transmission-film	8" x 10"	60,687	45.00
Proj. R. Image-film	2 1/2" x 4"	41,092	7.50
Proj. R. Image-film	4" x 5"	41,095	15.00
Dbl. Image-film	2 1/2" x 4"	41,091	7.50
Dbl. Image-film	4" x 5"	41,094	15.00
Reflection-film	4" x 5"	41,093	30.00

"HI-DRIVE" MOTORS WITH GRAPHITE BRUSHES



Use them in your hobby, research projects, industry, portable appliances, etc. Available in 3-6 and 6-12 volt models. Low noise level suitable for sound reproduction and recording equipment. Long life with low current drain. 6000-9500 RPM at no load (depending on battery voltage). Many excellent features; operates in any position, reversible, self-lubricating bearings, graphite-tipped adjustable brushes, replaceable brush and terminal assembly, Alnico magnet field, layer-wound rotor, thermosetting plastic case efficiently cooled. Measures 1 1/4" high x 1 1/2" wide x 1 1/8" long. Shaft is 1 1/2", 3/32" diam. Wt. 1.94 oz.

3 to 6 volt

No. 41,081 \$2.50 Postpaid

6 to 12 volt

No. 41,082 \$3.00 Postpaid

ACCESSORIES FOR 3/32" SHAFT-DIAM. MOTORS

Use the following items to get the most out of 3/32" shaft-diam. motors. Power toys, small turntables, research projects, etc.



(A) **Power Drive Accessory Kit.** Enough items to make almost every type of power drive for wide range of speeds. Contains 4 shaft-bearing brackets, 5 spur gears, crown gear, friction drive-wheel and many other parts. Quiet, solid brass pinions are long-wearing. Polished steel shafts.

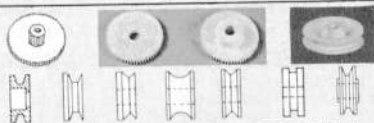
No. 60,678 \$3.00 Postpaid

(B) **Shaft Supports.** Two kits in one. Includes both fixed and adjustable-height supports. **Fixed height:** 3 pairs of shaft supports (1/2", 3/4" and 1"); four, 3/32" diam. shafts; 1 shaft connector; 2 locking collars and all necessary screws. **Adjustable height:** 4 bases; 10 shaft supports; spacing collars and mounting screws. Supports lock in bases to provide 7/8" to 3 3/8" shaft elevators. Use with pulleys below.

No. 60,676 \$5.00 Postpaid

(C) **Pulley Kit.** A handy item in any workshop. Provides the correct pulley for almost every small job. Contains 8, polished-aluminum pulleys (1, 2 and 3-step) 1/4" to 3/4" diam.; 2 tension-spring belts; bag of set screws; clear plastic case.

No. 60,677 \$2.00 Ppd.



NYLON GEAR AND PULLEY ASSORTMENT

These gears and pulleys are made of Dupont type #101 natural color nylon. All have a tolerance of .004 per inch. The variety of sizes assures you of having the correct gear or pulley when you need it. Many uses in industry, research, and development, workshop, hobbies.

32-Pitch Spur Gears—46 gears in all; 2 each from 12 to 62 teeth. Pitch diameters from .375 to 1.933. 14 1/2° pressure angle, hole diams. from .125" to .927".

No. 60,679 \$15.00 Postpaid

48-Pitch Spur Gears—50 gears; 2 each from 12 to 80 teeth. Pitch diams. from .250 to 1.667. 14 1/2° pressure angle, hole diams. from .094 to .315. Contains 2 gears with square holes (.190 and .315) and 2 with elongated holes (.145 diam.).

No. 60,680 \$15.00 Ppd.

48-Pitch Combination Gears—48 gears; 2 each from 12 to 16 pinion teeth and 36 to 80 gear teeth. 1/8" hole diam. Overall 3/8" thick (1/8" gear, 1/4" pinion). 14 1/2° pressure angle.

No. 60,681 \$15.00 Ppd.

Pulley Assortment—44 pieces; 2 each of 22 different pulleys in 7 useful styles (see diagram). Slot width from 0 to .875. Bore from .070 to .530.

No. 60,682 \$15.00 Ppd.

NEW! "ALL ABOUT TELESCOPES"

The Best Illustrated And Most Easily Understood Book About Telescopes And Astronomy.

by Sam Brown

✓ EXCELLENT GUIDE FOR BEGINNERS ✓ INVALUABLE REFERENCE MATERIAL
FOR ADVANCED AMATEURS ✓ BELONGS IN EVERY SCHOOL AND PUBLIC LIBRARY.

Whether you are a beginner looking for information and guidance about the type of telescope you should build or buy; or an advanced amateur seeking help in ray tracing or a formula to work out object-image sizes—YOU NEED THIS BOOK. Written in Sam Brown's down-to-earth, easily understood style, this 192-page (including covers) book is one-half text with the other half consisting of clear, how-to-do-it illustrations. It contains Sam's previous books on telescopes and astronomy including:

- **"TELESCOPES YOU CAN BUILD"**—step-by-step building instructions covering both simple and ambitious terrestrial and astronomical telescopes; telescope accessories, mounts, etc.
 - **"HOW TO USE YOUR TELESCOPE"**—explains how to select the right telescope; hints on observing the planets, sun; finding sky objects; collimation; etc.
 - **"HOME BUILT TELESCOPES"**—describes how to grind, polish and test a reflector telescope mirror. Includes tables on grinding schedules; hints on mirror correction and mounting.
 - **"TELESCOPE OPTICS"**—easily understood material on telescope optical design. Covers focal length, image object problems, home-made eyepieces, objectives (mirrors and lenses)—numerous tables.
 - **"PHOTOGRAPHY WITH YOUR TELESCOPE"**—how to take exciting pictures of the moon, planets, stars; long distance shots of birds, animals, terrain. Includes tables on image sizes, fields, etc.
 - **"TIME IN ASTRONOMY"**—Describes 3 kinds of Solar Time, Mean to Standard, Standard to GMT., Sidereal Time, Time Around the World, how to find stars, use of setting circles, etc.
- Plus additional pages of new material covering "Getting Acquainted With The Telescope", "Observing The Sky Show", "Collimation and Adjustments", index, etc.

A "must" for amateur astronomers. Belongs in every library. Has no equal for simple, lucid and comprehensive material. Makes an excellent gift. All about Telescopes, 8½" x 11", perfect binding, 192 pages (incl. paper covers). Available about November 1, 1967

No. 9094 \$3.00 Ppd.



TRANSPARENT DOMES PROTECT DISPLAYS



These sturdy, plastic domes are optically clear. Exclude dust, moisture, insects from your displays, models, products, etc. Covered items are completely safe, yet fully visible. When inverted, and positioned on suitable base, make large transparent bowls. Made of clear ½" acrylic plastic... odorless, non-conductive and non-toxic. 12" diam. x approx. 6" deep.

No. 80,108 \$9.00 Ppd.

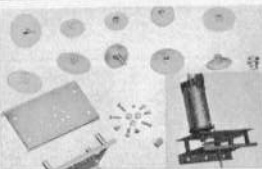
20½" diam. (approx.) x 10" deep. Shp. wt. 8 lbs.

No. 85,178 \$19.50 Transp. Chgs. Coll.

VARIABLE GEAR DRIVE KIT

A low-cost kit of miniature gears and parts to build different drive ratios. A must for junior engineers. Ideal for driving models, useful for laboratories and small rotating devices. Kit includes drive pulley, 2 drive shafts, assortment of 10 gears, supporting frames, spacers, screws and hardware. Specially adapted (see insert) to use our Electric Motor, No. 40,902 (page 54). Weighs 10 oz. Complete kit without motor.

No. 60,675 \$3.00 Ppd.



INTERESTED IN BETTER FISHING?

Want to improve your local fishing spots? Now it's easy, for you and your friends, because there is a practical, inexpensive and successful solution to the problem. "Old Tires: The ideal material for building FISH HAVENS", by Norman W. Edmund, has most of the answers. For your FREE copy of this fully illustrated, 16 page, how-to-do-it book, send a 5¢ stamped, self-addressed No. 10 envelope, to Box 500, Edscorp Building, Barrington, N. J. 08007. Practical items, listed below, will help you to get started on your project.

MODEL TIRES FOR PLANNING

Approx. 2" diam. **No. P-70,927 Pkg. of 25 \$3.00 Ppd.**
Approx. 5¼" diam. **No. 60,654 each \$1.00 Ppd.**

FOR PRODUCTION

10" Tungsten Carbide Rod Saw Blade. Fits regular hacksaw frame. Cuts tire bead wires. **No. 70,928 \$2.25 Ppd.**
Plastic Strapping and Plastic Clips. Inexpensive nylon material for binding tires together. Pkg. approx. 100 ft. strapping and 50 clips. **No. P-70,926 \$3.00 Ppd.**

6. Spade-type drills for cutting holes in tires to eliminate air pockets. ¾", 1½", 5/8", 3/4", 7/8", 1" with ¾" diam. shaft (fits ¼" electric drills). Imported. Set of 6 drills. **No. 60,655 \$1.00 Ppd.**

FOR PROMOTION

Auto Bumper Stickers in 3 colors. "SAVE OUR MARSHES FOR FISH AND OTHER WILD LIFE."

Pkg. of 10. **No. P-70,924 \$1.00 Ppd.**
Pkg. of 100. **No. P-70,925 \$9.00 Ppd.**

"FISH HAVENS" booklets, quantity prices on request.

SURPLUS DISPLAY MOTORS

R.P.M.	Rotation	Stock No.	R.P.M.	Rotation	Stock No.	R.P.M.	Rotation	Stock No.
6	CW	41,071	12	CW	41,075	36	CW	41,079
6	CCW	41,072	12	CCW	41,076	36	CCW	41,080
8	CW	41,073	24	CW	41,077			
8	CCW	41,074	24	CCW	41,078			

CW, clockwise; CCW, counter clockwise

FIBER OPTICS LIGHT TREES

BEAUTY BEYOND BELIEF

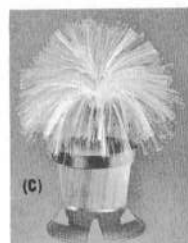
- An Edmund First . . . Fiber Optic Light Trees . . . Completely New . . .
- Thousands of Light Points and Illuminated Strands
- An Array of Constantly Changing Colors
- A Most Unusual Display for Home Owners, Decorators, Store Exhibits, etc.

THE STORY . . . Shortly after the introduction of inexpensive plastic fiber optics, we discovered that they opened up a whole new fantastic wonderland of decorative lighting possibilities. Stripping about 6 inches of covering from one end of a 64-strand light guide, causes the individual .01" diam. strands to spread out. Place the other end of the light guide over a light source and you have 64 light points plus illuminated strands. Artistically arrange a number of light guides. Add a color wheel above the light source, and you have a fiber optic tree. It's so fascinating when viewed in subdued lighting, that people exclaim "It's too beautiful for words".

Now, for the first time anywhere, you can get one of these striking, attention-getting trees. Includes many outstanding features: (1) Rotating color wheel provides a variety of 5 basic colors. Trees constantly change from a single color to multi-color and vice versa . . . a ripple effect. (2) Light source, color wheel, cooling system, etc. are all concealed in attractive, walnut-finished, plastic planter-base. (3) Forced ventilation with high quality fan. (Fiber optics withstand temperatures up to 176°F. Do not expose to flame.)

Fiber optic trees are excellent displays for:

Homes	Restaurants	Cocktail Lounges
Stores	Exhibits	Hotels and Motels
Show Windows	Lobbies	Other Public Places



3 Styles Fit Any Decor—Trees 28" High

Beautiful, large trees with approx. 8,320 light points. In addition to other outstanding features, trees include light absorption disc, cord and plug with switch, plus your choice of quartz iodine lamp . . . 250 watts (gives 5,000 lumens, 2,000-hr. life) or 500 watts (gives 10,000 lumens, 2,000-hr. life). Comes completely assembled.

- | | | |
|--------------------------------|------------|----------------|
| (A) Weeping Willow, 250 watts. | No. 80,110 | \$350.00 Ppd. |
| (A) Weeping Willow, 500 watts. | No. 80,112 | \$365.00 Ppd.* |
| (B) Tree Style, 250 watts. | No. 80,111 | \$350.00 Ppd. |
| (B) Tree Style, 500 watts. | No. 80,113 | \$365.00 Ppd.* |

*Recommended for use in locations where lighting cannot be subdued.

(C) 18" Fiber Optic Light Bush. 3,904 points of light. Overall height 18". High intensity bulb with 500 hour life. Other features same as above.

No. 70,972 \$150.00 Postpaid



MULTI-COLORED FIBER OPTICS LIGHT WAND

Gives a beautiful assortment of 660 colored light points. We've attached fiber optics, with artistically colored inside tips, to the end of an attractive, chrome-finished penlight. Makes a most unusual gift that fascinates everyone who sees it. One, so differently new, it will be

shown to everyone. For added versatility, the fiber optics are spread out in shape of a brush. Lightweight for easy use. Measures 8 3/4" overall. (Batteries not incl.) A truly unique item that shows the beauty and versatility of fiber optics. **No. 60,688 \$6.75 Ppd.**

FIBER OPTICS IDEA BOOKLET . . . Only 75¢

In this completely illustrated booklet you'll find over 100 exciting design and application ideas for fiber optics. Whether you're an experimenter, inventor, artist, designer or a hobbyist you'll be amazed at the many uses of fiber optics. Booklet includes ideas for various industrial and decorative uses with many unusual applications. Design your own fiber optic trees or other unique arrangements. Gives ideas for Science Fair projects, exciting displays, etc.

No. 9095 75¢ Postpaid

USE MIRRORS TO MAKE FIBER OPTIC TREES EVEN MORE OVERWHELMINGLY BEAUTIFUL!

Imagine the stunning display of a fiber optic tree's 8,320 tiny points and strands of multi-colored ever-changing light. Multiply this effect by many times and the result is a myriad of color, light and movement that is so pleasing you could watch it for hours. This fascinating display is accomplished with our fiber optic trees and by mounting mirrors in back of or around them. Especially effective are our large sheets of 2" x 2" mirrors on a flexible cloth backing. These are easily arranged into a curved or corner-shaped background that gives multiple reflected images. Each flexible sheet contains fifty, 2"-square mirrors in a 5" x 10" arrangement. Measures 10" x 20" overall. 2 sheets (50 mirrors each) **No. P-70,970 \$10.00 Ppd.**

**FIBER OPTICS LISTINGS AND DESCRIPTION
SEE PAGE 87
GLASS FIBER OPTIC EXPERIMENT KIT, PAGE 94**

BARGAIN PRICES! HARD TO GET NICKEL-CADMIUM CELLS AND BATTERIES . . . USED, SURPLUS, GUARANTEED

OUTSTANDING ADVANTAGES

- CAN BE RECHARGED IN 1/2 HOUR (with proper equipment)
- LIFE ALMOST UNLIMITED . . .
- MINIMUM MAINTENANCE . . . add a few drops of water a year
- DELIVERY ALMOST 100% OUTPUT at temperatures below freezing
- RUGGED NYLON CASE (Nos. 70,942, 41,096, 70,969) withstands shock and vibration . . .
- VENTED FOR SAFETY during fast charging or discharging
- APPROX. HALF WEIGHT OF COMPARABLE LEAD-ACID BATTERIES

Truly superior for hundreds of uses in industry, labs, engineering departments, school science and shop courses. Hobbyists, amateur photographers, campers, model builders, etc. will appreciate the long-life, economy and dependability of these nickel-cadmium cells and batteries.

GOV'T. SURPLUS NI-CD 6-VOLT BATTERIES (4-AMPERE-HOUR)

Tops for such applications as: (1) rechargeable portable lanterns, (2) scooter, bicycle and boat lights, (3) camp lights, portable fluorescent and ultraviolet lights, (4) electronic flash units, powering movie cameras. Perfect power source for our miniature motors, model boats, cars, models, etc. These are used, military surplus, nylon cased cells banded together to build a compact, 6-volt, 4 ampere-hour battery. Cells do not give off corrosive fumes and won't deteriorate if stored in either charged or discharged state. Maintain constant voltage through major portion of capacity. Each vented, nylon cell measures 6" high x 2" wide x 1/2" thick. Supplied with electrolyte and partially charged. 6 volt battery of five 1.2-volt, 4-ampere-hour cells, composition end pieces, all strapped together with 3 polypropylene bands. Measures 3 3/8" wide x 2" thick x 6" high. Net Wt. 2 lbs. Guaranteed.

No. 70,942 Each \$15.00 Ppd.

SPECIAL . . . New, Single, Industrial Surplus, 1.2 Volt Cells, same specs as above No. 40,798 \$3.95 Ppd.

GOV'T. SURPLUS, NI-CD CELLS AND 6-VOLT BATTERIES (10 AMPERE-HOURS)

These cells and batteries have similar characteristics (nylon case, vented cells, high discharge rate even below freezing etc.) to No. 70,942 listed above. Larger in size, they offer 2 1/2 times (10-ampere-hour) more storage capacity. Their long life, shock resistance and charge retention qualities, plus lower maintenance requirements makes them excellent for replacement purposes. Each 1.2 volt cell, supplied with electrolyte and partially charged, measures 1 1/4" thick x 2 3/8" wide x 7" high. Terminals are 3/16" diam. 24 t.p.i. Wt. 1 lb., 7 oz. 6-volt batteries consist of 5 cells, composition end supports, bound with 3 polypropylene straps. Measures 2 3/8" thick x 6" wide x 7" high. Wt. 7 lbs. Used and guaranteed.

1.2-volt, 10-amp.-hr. cell.

6-volt, 10-amp.-hr. battery.

No. 41,096 \$9.30 Postpaid
No. 70,969 \$46.50 Postpaid

SURPLUS, JUMBO CAPACITY, 1.2-VOLT CELLS (275-AMPERE-HOUR)

Designed for stationary applications requiring consistent dependability, plus large storage capacities. Cells, connected in series, provide D.C. power sources for laboratories, starting batteries for emergency power plants, electrical switch gear etc. Each cell has sturdy steel case with vent, and four 1/2" spacers. Double positive and negative terminals, 3/8"—24 T.P.I. (color coded) are provided. Measures 6" deep x 8 3/8" wide x 15 3/8" overall height. Wt. approx. 53 lbs. Industrial surplus, used, guaranteed, discharge graph included. Supplied with electrolyte and partially charged.

No. 85,179 \$95.00 T.C.C.



Charger Kit for 6-V Battery. No. 70,962. Charges in approx. 1 hour, shuts off automatically. Will charge No. 70,969, but takes 2 1/2 hours. Assembly instructions incl.

No. 70,807 \$8.00 Ppd.

Low-Cost Trickle Charger revitalizes 1 to 10 Ni-Cd cells (1.2 to 12 volts) at any rate from 10 to 250 milliamperes. Use to "trickle" charge cells and batteries above plus smaller sealed and semi-vented cells. Takes longer than No. 70,807. Bakelite case 6 1/4" x 3 3/4" x 2"; wt. 3 lbs. Pilot light. 5-ft. cord and instr.

No. 70,812 \$10.95 Ppd.

POWER FLASHLIGHT, PORTABLE RADIO, TOY OR FLASH GUN FOR 5 YEARS WITH ONE SET BATTERIES

Space age, nickel-cadmium batteries are making ordinary batteries (the kind you're always running out to buy) obsolete.



This low-cost, highly efficient kit includes a compact

battery charger and 2 "D" size Ni-Cd batteries that you can recharge over and over again to full power. Power output remains constant (doesn't fade away like ordinary lead-acid cells) and batteries are backed by the manufacturer's 5-year guarantee. Durable, black plastic charger, 5 3/8" x 3" x 1 3/4" deep, plugs into standard wall outlet. Charges either one or two "D" or "C" size batteries. Light tells when unit is charging; will not overcharge. Takes 16 hours to completely charge one or two cells.

No. 60,591 \$9.95 Ppd.

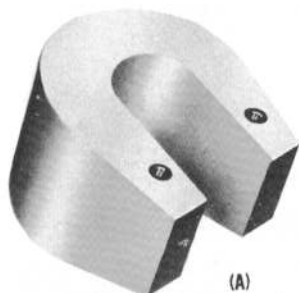
No. 60,593 \$5.98 Ppd.

No. 60,594 \$4.98 Ppd.

No. 60,592 \$5.98 Ppd.

BULLETIN No. 74 LISTS ADDITIONAL NI-CD BATTERIES

GIANT WAR-SURPLUS MAGNETS



Edmund is "Magnet Headquarters U.S.A."—here you can save 30% to 80% on magnets from real giants to mighty midgits on next 2 pages. Some are war surplus—Some are commercial surplus, and others are current commercial manufacture, but all are offered at bargain prices. Manufacturers, many of our smaller Alnico magnets are also listed in quantity lots of 100. Take advantage of these to secure even greater savings. Big 154-lb. magnet at left LIFTS 350 POUNDS in the air . . . even more submerged! Our most popular 5-lb. lifts 150 pounds.

PLEASE NOTE, MAGNETS CANNOT BE SHIPPED BY AIR.

Giant horseshoe magnets are widely used to:

- Fish for "treasures" on lake and stream bottoms . . . recover lost anchors, chain, tackle, etc.
- Remove tiny metal scrap from products to be sold
- Hold crankshafts for grinding . . . also used industrially and in the home workshop as a vise for welding, gaging, aligning, polishing, drilling and boring
- Clean shop floors, parking lots and driveways of scrap metal, chips, nails, etc.
- Recover tools from dip or coolant tank
- Demonstrate magnetism in school and college labs

Magnet Wt. (lbs.) (A)	Magnet Size (Inches) (B) (C) (D) (E) (F)	Lifts Avg.† (lbs.) Gauss
15¾ 5¾	3¾ 5½ 2½ 2½ 4¾	350 1890
16 6	2¾ 7 2¾ 3 5	180 830
7½ 4	2¼ 4½ 2 2 4	175 1400
5 3½	2¾ 4¾ 1¾ 1¼ 2½	150 2075
3½ 2¾	2¾ 3¼ 1¾ 1¼ 2¾	40 1700
1½ 2½	1¾ 2¾ 1¾ 1¾ 2½	25 1130
3½oz. 1¾	5½ 1¾ ¾ ¾ 1¼	1¼ 810
1¼oz. 1¼	¾ 1¾ ¾ ¾ 1¼	8

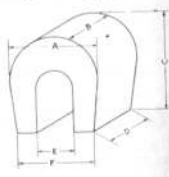
Order from table below. Dimensions and proportions A, B, C, D, E, F, are also given. See diagram below for key.

†Gauss, a unit used to measure magnetic flux, reflects the average field strength at the center of the magnet's gap (between poles). This is stronger nearer poles, or if gap is decreased by adding ferrous pole pieces.

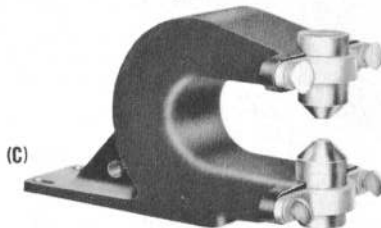
The 16-lb. magnet listed has ¾"-radius, semi-circular grooves in its face; use as is for gripping pipes or circular objects. Cold rolled steel inserts are included to increase its strength for other uses.

Most horseshoe magnets are Alnico V (a blend of aluminum, nickel, cobalt and iron for high strength).

Comments	Stock No.	Price, Ppd.
Trans. Chgs. Coll.	85,152	\$33.60
10½" bracket	70,396	22.50
	70,572	18.75
Best for "fishing"	70,571	12.50
Alnico V (see above)	70,570	8.75
Alnico V (see above)	60,215	5.75
Pkg. of two; midgit	P-40,275	1.25
Pkg. of two; midgit	P-40,929	1.10



DO YOUR OWN MAGNETIZING WITH THESE WAR-SURPLUS GAP MAGNETS



(A) Fixed Gap. Use in any convenient position; base has two tapped holes (10-32 thread) for rigid mounting. Gap of 1½" between ¾"-diam. center poles. Flux at center of gap 1935 Gauss, on center of pole surface 3124 Gauss. Overall 5½" long x 3¾" high x 1¾" thick. With cylindrical keeper. Wt. 3 lbs. 4 oz.

No. 60,461 \$12.50 Ppd.

Magnetron Tube RCA 2J41. Govt. cost \$272.00. Has 4-lb. gap magnet.

No. 80,085 \$39.50 Ppd.

(B) Horn Gap Magnet. Has 1¾" fixed gap between 1½" diam. pole pieces. Rating is 1330 Gauss. Horns, 1½" diam. at base are 3¼" apart. Max. distance from base to center of pole is 2½". Base measures ½" x 1½" x 7¾". Has 8 mounting holes (4¼", 4¼", 4¼", 4¼"). Keeper included. Wt. 6¾ lbs.

No. 70,943 \$30.00 Postpaid

(C) Adjustable Gap. Magnetic field (flux) adjustable from 1500 to 3,000* Gauss and higher! Invaluable tool for industrial and school shops, laboratories, assembly lines, etc. Use over and over to magnetize endless small tools or other magnets by simply passing them through the gap . . . does not reduce power of master (gap) magnet. Clamps with wing nuts hold pole pieces securely at any desired gap up to 1½". 1½"-diam. pole pieces taper to ½"-diam. flat faces. Overall size 11½" long x 6¾" high x 5" wide. Mounting plate has bolt slots ½" wide x ½" long. Wt. 17 lbs. 8 oz. (Shpg. wt. approx. 21 lbs.) * (with ¾" Gap)

No. 70,810 \$27.50 Trans. Chgs. Coll.

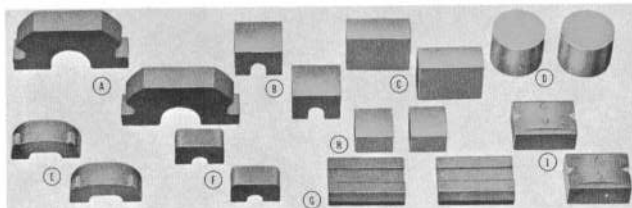
FLEXIBLE MAGNETIC STRIP . . . Low as \$1.25/ft.

Used in refrigerator doors because it mounts easily, pulls just enough to give a good seal, yet permits easy opening and closing. Replace that worn out door gasket now. 1400 Gauss. One strip can be cut into as many as 32 utility magnets for signs. 1-foot lengths in black only. ¾" x .180".

No. 60,092 \$1.25 Ppd.

1½" x .250". **No. 60,093 2.00 Ppd.**



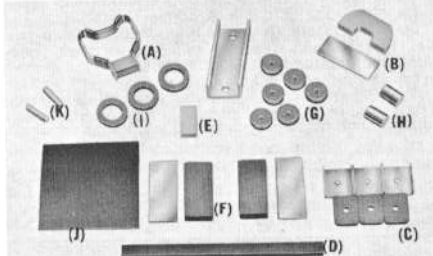
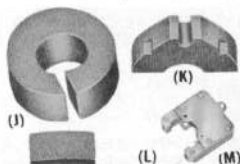


SALE SURPLUS ALNICO MAGNETS

Here are terrific bargains that cannot be repeated. One of the most famous U.S. manufacturers of Alnico magnets discontinued production—and we bought entire inventory. You save 33⅓% to 90%! Hundreds of uses, specifications at right.
Set of 18 (as shown). Wt. 1 lb. 2 oz. **No. 60,581 \$4.00 Ppd.**
3-lb. Assortment. Set above plus variety of similar ones.
No. 70,827 \$10.00 Ppd.

SPECIFICATIONS—Those illustrated (plus others) available separately

Item	Size (In.)	Wt. (Oz.)	Avg. Lbs.	Lift Oz.	Pkg. Of	Stock Number	Price Ppd.	Pkg. of 100	Price Ppd.
(A)	1 3/4" x 7/8" x 3/16"	2.0	2	13	4	P-40,910	\$2.50	P-70,828	\$50.00
	1 3/4" x 7/8" x 1/16"	2.0	11	2	2	P-40,916	2.25		
	1 1/4" x 3/4" x 3/16"	1.7	9	4	2	P-40,950	1.80		
	1 1/4" x 1/2" x 3/32"	0.9	6	4	4	P-40,951	2.15		
(B)	3/4" x 3/4" x 3/16"	0.9	7	14	8	P-40,912	2.30	P-70,829	23.00
(C)	1 3/4" x 3/4"	1.3	4	13	8	P-40,905	3.00	P-70,830	30.00
	1 1/4" x 3/4" x 3/32"	1.4	3	8	2	P-40,962	1.85		
(D)*	5/8" x 3/32" diam.	1.5	1	2	10	P-60,577	2.00	*P-70,831	16.00
(E)	1 x 3/4" x 3/32"	0.5	4	13	10	P-40,909	2.00	P-70,832	16.00
	1 x 3/4" x 3/4"	.75	10	10	2	P-40,974	2.00		
(F)	3/4" x 1/4" x 1/32"	0.4	4	0	10	P-40,911	2.00	P-70,833	16.00
(H)	1 1/8" x 3/4" x 1/4"	0.9	3	0	8	P-40,906	2.10	P-70,834	21.00
(I)	3/8" x 1/2" x 3/32"	0.5	1	10	12	P-40,904	2.00	P-70,835	13.35
	1/2" x 1/2" x 3/32"	1.0	4	8	8	P-40,907	2.70	P-70,836	27.00
*Write for special prices on quantities of 1000 or more									
Other Configurations									
(J)	1 1/2" O.D. x 1/2"	2.0	—	—	4	*P-40,964	\$2.35	Comments	
(K)	1 1/4" x 3/4" x 3/16"	0.7	6	0	4	P-40,952	1.75	*3/16" x 3/16" center hole, 1/8" gap	
(L)	1 1/4" x 1/2" x 3/16"	1.2	3	4	4	P-40,961	2.60		
(M)	7/8" x 7/8" x 1/16"	1.0	4	0	2	P-30,564	1.00	Tapped for mounting	



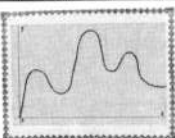
23-PC. MAGNET ASSORTMENT

Including new "pole pieces" for ceramic magnets that increase pull 5 to 9 times. (Some lift at least 160 times their own weight!) A ready supply of magnets for: tool or knife holder, pick-up tool, bulletin board, stud finder, magnetic games, etc. Dozens of industrial uses.

- A) Alnico magnet (3/4" x 3/8" x 3/16") with handle.
- B) U-shaped alnico magnet (approx. 1 1/4" long).
- C) Three flat ceramic magnets (3/4" x 1" x 3/16").
- D) Flexible magnetic strip (6" x 3/8" x 3/16" thick).
- E) Alnico bar magnet (1" x 1/2" x 1/4").
- F) Two POWERFUL ceramic magnets (1 1/8" x 7/8" x 3/8").
- G) Six ceramic disc magnets (3/4" diam. x 1/16" thick).
- H) Two alnico cylinder magnets (3/8" diam. x 3/8").
- I) Three ceramic disc magnets (1" O.D., 1/2" I.D. x 3/32").
- J) Flexible magnetic sheet (3" x 3" x 1/32" thick).
- K) Two alnico "baby-bar" magnets (7/8" x 3/4" x 1/8").
- L) 4 channel-type pole pieces; and 1 bar-type keeper. All magnets described above, plus complete directions. **No. 70,780 \$5.00 Ppd.**

Items From Above Available Separately:

- (B) Pkg. of 2 (no pole pieces). **No. P-40,768 \$1.00 Ppd.**
- (C) Magnets only. Pkg. 10. **No. P-40,637 1.00 Ppd.**
- Pkg. of 100. **No. P-60,347 9.00 Ppd.**
- Pole pieces only. Pkg. 10. **No. P-40,862 .75 Ppd.**
- Pkg. of 100. **No. P-60,560 5.00 Ppd.**
- (F) Magnets only. Pkg. 2. **No. P-40,861 1.00 Ppd.**
- Pkg. of 12. **No. P-60,558 5.00 Ppd.**
- (G) Package of 25. **No. P-40,857 1.00 Ppd.**
- (I) Package of 8. **No. P-40,846 1.00 Ppd.**



FLEXIBLE MAGNETIC CORD

Clings to any iron or steel surface in almost any curved shape you desire. Plot large, easy-to-read graphs and charts that can be instantly changed. Demonstrate power curves, maxima and minima points on an equation line, instantly changing equation lines. Youngsters enjoy "sketching" countless shapes and figures with magnetic cord. Helpful in teaching blind students the alphabet, figures, forms. Loads of fun for all on the kitchen refrigerator. 3/32" diam.

- 10-ft. length. **No. 40,875 \$2.50 Ppd.**
- 25-ft. length. **No. 40,876 \$6.00 Ppd.**

CHANNEL MAGNET WITH HANDLE



Amazing 25-lb. pull holds maps, charts (even corrugated cardboard) to ferrous surfaces. Oriented ceramic magnet bonded inside U-shaped channel with attractive, gold-finished handle.

- 3 1/8" long. **No. 40,847 \$1.00 Ppd.**

FLEXIBLE MAGNETIC TAPE

This 1/16"-thick tape is excellent for your car dash, medicine cabinet, bulletin board or workshop. One side is magnetic, the other adhesive. Roll is 30" long and 1" wide.

- No. 60,208 \$1.98 Ppd.**



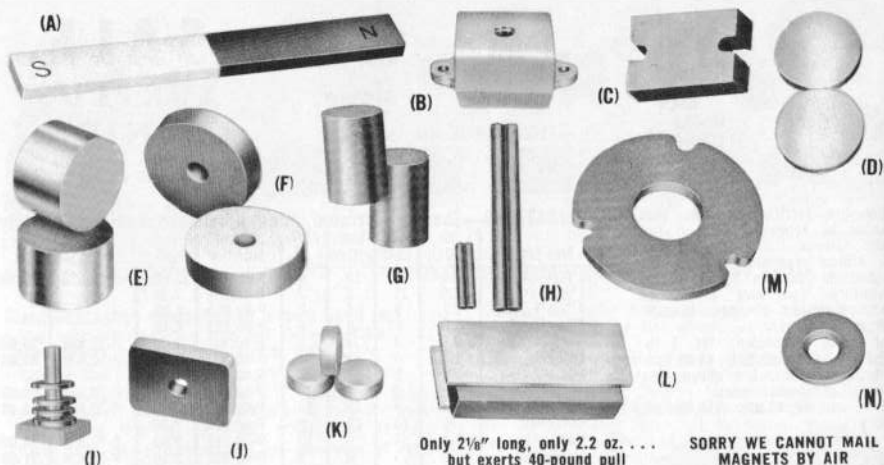
MAGNETS ... THE EDUCATION OF A PHYSICIST

Dr. Bitter in this very readable book tells of his life-time of work with magnetism and in so doing imparts a wealth of information. Covers all phases ... ferromagnetism, nuclear magnetism, etc. Paper bound, 4 1/4" x 7", 155 pages. **No. 9279 \$1.25 Postpaid**

Powdered Cast Iron. 1-pound package for experiments and demonstrations. **No. 60,176 Only 75c Ppd.**

See New Magnetic Holder for penlights, pipes—Page 61

MAGNETS



Only 2 1/8" long, only 2.2 oz. . . .
but exerts 40-pound pull

**SORRY WE CANNOT MAIL
MAGNETS BY AIR**

GIGANTIC SELECTION OF ALNICO AND CERAMIC MAGNETS

Countless applications in the home, school, shop or laboratory. Excellent for magnetic bulletin boards (hang messages, notes, recipes), for pick-up tools, games, etc. Demonstrate the many theories of magnetism. Holes in some for mounting or adding handles.

Magnets provide hours of fun for children. They can be used to demonstrate repulsion and attraction or just for magnetic tricks that are loads of fun. See Magnet

Kit, Magnetic Cord and book "The Education of a Physicist" on page 15; also the Electromagnets on pages 43, 61.

Alnicos—blends of iron, nickel, aluminum and cobalt—are strong and have a high degree of stability.

Ceramic magnets are basically ferrites, but more brittle. They are very resistant to demagnetization, especially the oriented types as magnet (K).

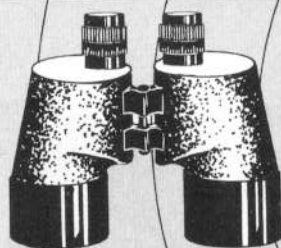
Item	Shape	Size (inches)	Lifts (lbs.)	Comments	Quantity	Stock No.	Price, Ppd.
ALNICO.							
(A)	Bar	3/4 wide x 6 long	1 1/8	NDEA specs. (CCSSO #2340)	1	40,421	\$2.00
(B)	Door Catch	1 3/4 x 3/4 x 5/8 high	2 1/2	Originally for cabinet doors	2	P-40,424	1.00
(C)	Rectangular	1 3/4 x 1 3/4 x 3/8	2	Small but strong	1	40,371	.60
(D)	Disc	1 1/4 diam. x 3/32 thick	3 1/8	Alnico I	2	P-40,419	2.00
(E)	Cylinder	5/8 diam. x 3/4 thick	1 3/8	Good for bulletin boards	2	P-40,646	\$.75
"	Cylinder	1 3/4 diam. x 3/8 thick	1/4	"	2	P-40,922	1.00
(F)	Disc	1 1/4 diam. x 3/8 thick	2 7/8	"	2	P-40,433	1.00
(G)	Cylinder	5/8 long x 1/2 diam.	1 3/4	Good for bulletin boards	2	P-40,480	.75
"	"	"	"	"	25	P-60,201	7.50
"	Cylinder	1 1/2 long x 1 1/2 diam.	3/4	"	2	P-40,923	1.00
(H)	Cylinder	3/8 diam. x 5 long	7/8	Alnico II; good demonstrator	2	P-60,131	3.00
"	"	1/4 diam. x 1 3/4 long	2 1/8	Alnico V; " "	2	P-40,418	1.20
CERAMIC.							
(I)	Demonstrator	2 3/8 O.D. x 1 I.D. x 1/4 thick	1 5/8	4 magnets on pole	1	70,265	\$5.00
"	Ring	2 3/8 O.D. x 1 I.D. x 1/4 thick	1 5/8	One ring magnet (above)	1	40,482	1.00
"	Ring	1 1/2 O.D. x 1/4 I.D. x 3/8 thick	1 1/4	"	2	P-40,707	1.00
(J)	Rectangular	1 x 3/4 x 3/8 thick	1/8	With 3/16" center hole	10	P-40,637	1.00
"	"	"	1/8	"	100	P-60,347	9.00
"	"	1 1/4 x 3/8 x 3/8 thick	1/8	"	20	P-41,107	1.00
(K)	Disc	1/2 diam. x 3/8 thick	1/8	"	25	P-40,820	\$1.00
"	"	"	"	"	100	P-40,819	3.50
(L)	Rectangular	1 7/8 x 7/8 x 3/8 thick	40	Oriented; 4 pole pieces	2	P-40,818	1.40
"	"	"	"	Oriented; 24 pole pieces	12	P-60,528	6.75
(M)	Ring	5 1/8 O.D. x 1 7/8 I.D. x 3/8 thick	11 1/4	Originally speaker magnet	1	60,578	5.00
(N)	Ring	1 1/2 O.D. x 3/8 I.D. x 3/8 thick	5/8	"	4	P-40,869	1.00

BRIDGE MAGNET LIFTS 120 LBS.

Available again, war surplus, Alnico bridge magnets. Hold objects for drilling, welding, soldering, etc.; recover lost items from tanks, streams, lakes; pick up ferrous metal scraps. Measures 3 3/4" wide, 3 1/2" thick, 2 1/2" high with 2" gap. Lifts up to approximately 120 lb. Weighs only 5 lb. **No. 70,573 \$13.50 Ppd.**

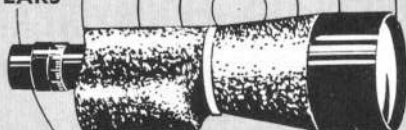
WAR SURPLUS ELECTROMAGNET, LIFTS 4 LBS.

A compact and inexpensive electromagnet for your shop, classroom or lab. Many practical applications. Operates on 110-115 volt, 60 cycle current. Measures approx. 2 1/2" x 2 1/4" x 1 1/2". Lifts up to 4 lbs. Wt. 9 1/2 oz. **No. 60,282 \$3.00 Ppd.**



HIGH POWER ZOOM MINIATURE MONOCULARS

BINOCULARS



IMPORTANT FACTS ABOUT BINOCULARS



Binoculars and Field Glasses. A Galilean field glass consists of two telescopes, one for each eye. This type of glass becomes very bulky in powers beyond 3X. Sportsmen and hunters seldom use them because of their size, weight, and small field of view. Sometimes field glasses are constructed to resemble prism binoculars. Do not be deceived. If the object lens is directly in front of the eyepiece, it is unlikely to be a true prism binocular.

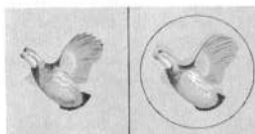
The prism system in a binocular enables a longer light path (related to magnification) to be built into a much more compact unit. Objective lenses too are farther apart than in a field glass, thus increasing the desirable stereoscopic effect.

Optical Correction refers to sharpness of image without distortion; and absence of undesirable color fringes.

Binocular Markings . . . 6X30, 7X50, etc. The first figure refers to the power, a magnification of 6X, 7X, etc. The second figure is the diameter in millimeters of each objective lens. There are 25.4mm to one inch.

Relative Light Efficiency. This item refers to the brightness of the image seen through a binocular. It takes into consideration not only relative brightness ("relative" size of the exit pupil) but also light loss (loss of image brightness within the instrument). A relative light efficiency figure is given for the binoculars and monoculars listed on the following pages. The higher this figure is, the brighter the image will be.

Zeiss type or American. Actually, the difference between the two is one of design. American type is more streamlined, and perhaps a little easier to hold.



Optical Alignment. Because binoculars have two separate optical systems, it is vitally important that each is correctly collimated, aligned one with the other; otherwise one eye looks in

one direction and the second eye in another. If the misalignment is minor the eyes will accommodate for it. When collimation is poor, eye strain is likely, accompanied by headaches. All the binoculars we make and supply are correctly adjusted and collimated before they leave our plant.

Center or Individual Focus. With the center focus adjustment, the right eyepiece is individually adjustable. Once set, the center focus will adjust for both eyes. Individually focusing eyepieces are used by the Armed Forces because they offer more sturdy construction and less chance for moisture to enter system. Sportsmen usually prefer individual focus. Bird watchers like center focus.

How to Select your Binoculars. How will you use them? The 6X30 is popular for sports events. Compact and comparatively lightweight, it can easily be carried all day. Because of its light weight, it is a fine binocular for the whole family to use. 7X50's, though a little larger and heavier, have a relative light-efficiency of 75 and so are excellent for viewing in low light situations. Binoculars, exceeding 9X, require a rest or a tripod because they greatly magnify minor movements.



6X30

Edmund's Famous American-Made Binoculars

- Compare with \$200. American Makes
- Tops for sports, races, hunting
- Complete with case and straps

In the years immediately following World War II, the U. S. Government sold inventories of binoculars and parts that had accumulated because of contract terminations. Edmund Scientific successfully bid for most of these inventories. Because of this, and because the Company has complete facilities to assemble and manufacture binoculars, we are still able to offer brand new American-made binoculars at prices 60 to 75% below other American ones. Their over-all quality is much better than most imported binoculars.

6X30. Compare these 6X30 binoculars with \$200.00 models! This money-saving bargain excites everybody. These excellent general purpose binoculars are brand new. Particularly suited for spectator sports, races and hunting in wooded areas . . . anywhere a lightweight binocular is important. Coated optics and individual focus.

This was one of the most widely used military binoculars. It is rugged and will hold up under all kinds of wear and tear. Over the years, it will cost less for repairs and adjustments than an imported pair. See specifications below.

6X30 No. 963 \$40.00 Postpaid

7X35. Our use of some war surplus parts and optics allows us to offer this instrument for less than 1/2 the price of comparable American-made binoculars. Coated optics and individual focus. See specifications below.

7X35 No. 964 \$55.00 Postpaid

7X50. Normally, American-made binoculars similar to these would cost you \$274.50. We are able to offer them, now, for \$74.80. Brand new, every optical element is coated. Assembled and collimated within government specifications. Rugged military design and construction, individual eyepiece focus. Ideal for use under poor light or as night glass, because size of exit pupil is the same as the maximum opening of the pupil of the eye (even when dark adapted). See specification table below.

7X50 No. 1544 \$74.80 Postpaid

RELATIVE LIGHT EFFICIENCY COATED OPTICS

Item	Field of View at 1,000 Yds.	R. L. E.	Exit Pupil	Approx. Weight
6X30	445 feet	37	5mm	22 oz.
7X35	400 feet	37	5mm	25 oz.
7X50	381 feet	75	7mm	46 oz.

See Our Flexible Neck Chain Page 104

BINOCULARS FROM JAPAN



(A)
7X50



(B) 6X30



(C)
20X50
(D)
20X70



(E)
7X35



(F) 7X35

CAREFULLY INSPECTED and COLLIMATED BY EDMUND

Here is a selection of fine quality prism binoculars imported from one of the better Japanese optical plants. All have achromatically corrected oculars and objectives. Oculars (field lens excepted), prisms and objectives are coated. All include case and straps.

(A) 7X50. Excellent for use with poor lighting conditions and optimum instrument from the standpoint of optical characteristics. Exit pupil matches maximum opening of human eye. Both models are Zeiss type. See specification table at right for complete details.

Individual focus. **No. 1524 \$30.00 Ppd.**
Center focus. **No. 1525 \$32.00 Ppd.**

(B) 6X30. Recommended for the traveller, nature study, hunting in wooded areas, yachting, etc. Not particularly good for night use. Zeiss type, center focus. See specification table at right. **No. 1537 \$23.50 Postpaid**

(C) 20X50 or (D) 20X70. High power, Zeiss-type with center focus and extra large light gathering objectives for greater luminosity. Ideal in flat open areas and for all work at very long range. Use with tripod. See table.

(C) 20X50. **No. 1538 \$35.00 Ppd.**
(D) 20X70. **No. 1540 \$71.00 Ppd.**

(E) and (F) 7X35. For all around use. Specially recommended for sportsmen, travellers, bird study or race track use. See table below for specifications.

Individual focus. (E) **No. 1512 \$26.50 Ppd.**
Center focus. (F) **No. 1509 \$31.50 Ppd.**

SPECIFICATION TABLE

Item	Field of View at 1,000 Yds.	R. L. E.	Approx. Exit Pupil	Weight
(A) 7X50	372 ft.	75	7mm	35 oz.
(B) 6X30	393 ft.	37	5mm	18 oz.
(C) 20X50	157 ft.	9.7	2.5mm	36 oz.
(D) 20X70	180 ft.	18.4	3.5mm	50 oz.
(E) 7X35	330 ft.	37	5mm	21 oz.
(F) 7X35	420 ft.	37	5mm	21 oz.

Note: R. L. E. numbers are based on coated optics.

WIDE ANGLE BINOCULARS



(A) 7X35



(B)

(A) 7X35. See over 50% more at 1,000 yds. With ordinary 7X35 binoculars, your field of view is only 375'; with our wide angle model, you see 578' or 11° 16' field. Great for general use and sports because of lightweight, compactness and power. Center focus. Featherweight magnesium body . . . only weighs 28 oz. All 16 optical surfaces coated. Case and straps included.

No. 1532 \$42.50 Ppd.

(B) 7X50. See almost 40% more! Field of view is 530' at 1,000 yds. as opposed to standard 376' field of ordinary 7X50's. Fully coated optics. Center focusing. Large 7mm exit pupil gives a bright image for night viewing. Rugged construction. Wt. only 42 oz. Velvet lined carrying case, straps, dust caps incl.

No. 1542 \$55.00 Ppd.

MINIATURE BINOCULARS

Many ladies favor them. Extremely useful for theatre, opera, indoor or outdoor sports, even bird watching.



(C)

(C) 6X25 Extreme Wide Angle. Extremely large (630' at 1,000 yds.) field of view. Center focus. Coated optics. Chrome plated. 4 3/8" x 2 5/8". Wt. 18 oz. Case and straps incl. Imported, collimated by Edmund.

No. 1541 \$34.95 Ppd.

(D) 6X15. Superb opera glass. . . hear better by seeing better. Coated optics. Individual focus and variable interpupillary distance. Measure approximately 3" x 2". Strap and leather case. Wt. 6 oz. From Japan.



(D)

No. 1505 \$19.00 Ppd.

EYEPIECE GREASE

Black, heavy-bodied grease, absorbs slight slack in threads, 4 oz. can. **No. 20,029 \$1.50 Postpaid**

Grease for sub-zero or tropical climates, 4 oz. can. **No. 20,027 \$2.50 Postpaid**

TRUE z-o-o-m



Change from 7X to 12X instantly... while viewing!

Extra versatile! Literally six different-power binoculars in one rugged, precision instrument with big 40mm objectives. Field of view at 1,000 yds. . . . 323 ft. at 7X; 289 ft. at 12X. Coated optics.

Popular, center-focus American type. Extra fast, extra smooth, fingertip zoom control lets you change from power to power instantly. Weight of binoculars only 34 ounces. Handsome carrying case and straps incl. Imported.

No. 1545 \$56.00 Ppd.

ACCESSORIES FOR AMERICAN-MADE BINOCULARS

Eyepiece Caps. Pkg. of two.

For 6 x 30's. With 1" inside diameter.

No. P-21,002 \$1.00 Postpaid

For 7 x 50's. With 1 3/4" inside diameter.

No. P-22,005 \$1.00 Postpaid

Polarizing Attachment. Reduce glare, see more clearly over water, from airplanes or viewing bright scenes.

For 6 x 30's.

No. 40,532 \$2.75 Ppd.

For 7 x 50's.

No. 20,000 \$2.00 Ppd.

TRIPOD MOUNT FOR BINOCULARS



Helps eliminate the "hand held" vibrations that make field of view unsteady. Accepts binocular shafts up to 5/8" diam. and will fit on any standard photographic tripod head 4 3/4" x 3/4" x 1". Black anodized aluminum. **No. 50,362 \$2.95 Ppd.**



7 x 50 MONOCULAR with TRIPOD SOCKET

Fine quality, compact instrument has coated optics and fits any photo tripod (or order table-top tripod listed separately). Weighs only 16 oz. Complete with carrying case, straps and directions for use as a telephoto lens with your camera (fits camera-monocular holder on page 113). Field of view 376 ft. at 1,000 yds.; R.L.E.-75; exit pupil 7mm. Monocular only, from Japan.

No. 70,639 \$17.95 Postpaid

Table-Top Tripod. See full description on page 113.

No. 50,229 \$2.00 Postpaid

Camera-to-Monocular Adapters. See page 113.

Series V.

No. 40,680 \$1.50 Postpaid

Series VI.

No. 40,769 \$2.25 Postpaid

IMPORTED 20x50 MONOCULAR

Has coated optics, high power, prism erecting system. Big 183" field of view at 1,000 yards. Exit pupil measures 2.5 millimeters. Complete with leather case, straps and dust caps. Overall length measures 9". Wt. only 12 oz. Extremely portable.



No. 50,152 \$24.50 Ppd.

10x20 POCKET MONOCULAR

This high power, prism erecting monocular has coated optics. Measures about 3" long. Carrying case included.

No. 70,126 \$12.50 Postpaid

NEW 2 1/2 POWER "SPORT SPECS"

For spectator sports, concerts, theatre; for warehouse & factory workers—bring the action 2 1/2 times closer. Also helpful for persons with low vision, but consult your eye doctor first.

Far superior to the cheap plastic models popular awhile back. All glass optics, low-reflection coated; achromatic (color-corrected) objectives. Individual focus down to 31". Interpupillary adjustment (72 to 62mm), arm ends flex slightly to accommodate most users. Two disadvantages are: 1) they are non-prismatic, so field of view is small (85 ft. at 1,000 yds.) and 2) they are of necessity lightweight, so collimation can be a problem . . . you may have to adjust them slightly to align. Only 5 1/4" x 6 1/4" deep, wt. only 4 oz. With plush-lined, leather case and elastic headband.

No. 1548 \$17.00 Ppd.



DESIGN, HAVE FUN WITH PICTURES THAT MOVE

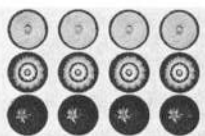
You've seen the signs that change their message as you walk by, the eyes that wink, the lips that kiss.

It's all being done with lenticular screens—low-cost, plastic sheets embossed with fine parallel lines—and a special printing process. When a lenticular screen is placed over a special, "multi-image print" and the two are moved only slightly (or if you simply move your head) the observed images change, disappear and reappear, creating a dramatic "motion picture."

Now you can purchase lenticular screens for your own use. Artists, designers, hobbyists will find them an exciting new medium for dimensional illustrations with motion.

Complete Sampler Kit. Excellent introduction to the technique, with numerous jewelry and art applications. Make eye-catching earrings, pendants, etc. One 5 3/8" x 3 3/8" x 1/4"—thick lenticular screen (64 lines per inch) plus 4 sheets with approx. forty-five 2 and 3-color designs printed to "switch" when placed beneath screen.

No. 60,589 \$2.00 Postpaid



Screen only. As described above, but larger. (64 lpi.)

8" x 6 1/2" size.

No. 60,590 \$2.00 Ppd.

13" x 16" size.

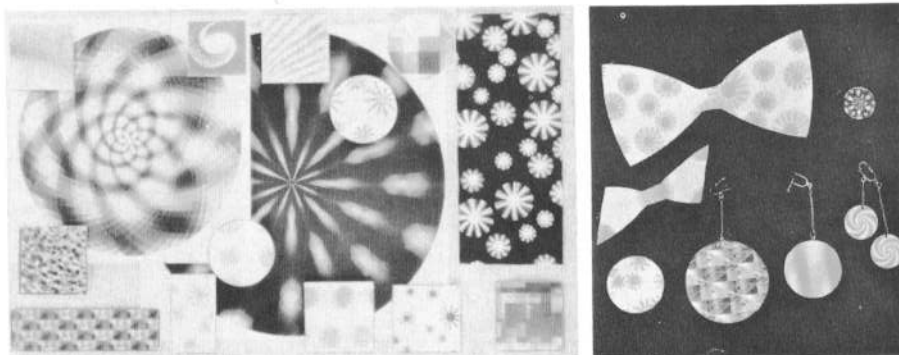
No. 70,847 \$6.00 Ppd.

8" x 10" size.

No. 70,937 \$2.50 Ppd.

Special Bargain, Slight-Seconds. May contain minor nicks and scratches, but function not affected. 21" x 28" size.

No. 82,044 \$13.50 Ppd.



"TAKE A TRIP" WITH PSYCHEDELIC ART TO THE "WAY OUT" LAND OF MOTION, COLOR AND DESIGN

Imagine every fireworks display you've seen; a Times Square sign spectacular gone berserk; a mirror maze in three dimensions; a double rainbow after a summer storm. Put them all together and set them in motion. Then you'll have some idea of the breathtaking color and movement of this mind-extending Psychedelic Art. It's brand new and has every indication of being much more popular, than our Diffraction Jewelry was, at this introductory stage. These patterns have not been available before. It almost defies verbal description, and no illustration does it justice.

Manufacturing processes are complicated. The surface is lenticular (lenslike) which is part of the story. Under it are specially-printed, multi-colored patterns. The whole is bonded in plastic. The closest example we can think of is an optical illusion known as "the winking eye". Perhaps you've seen it—a piece of plastic that shows a picture of a human eye. As you tilt it, it opens and winks.

Psychedelic Art is "in". As a conversation piece it has no equal... anywhere. Everybody, wants it for per-

sonal jewelry, wall hangings, table decorations, table tops (under glass), etc. Strongly appeals to the creative mind because multi-layered pieces can be assembled to produce "way-out" special effects and color schemes. Now, for the first time, Edmund offers exciting Psychedelic Art in the following forms:

ART PLAQUES—For Framing, Wall Hangings, Decorations—patterns 1 through 10.

DISCS, 2 1/2" DIAM.—For Mobiles, Jewelry, Decorative Attachments—10 assorted patterns.

JEWELRY FOR LADIES—Earrings, Hair Bows and Clips, Pins, Necklaces.

JEWELRY FOR MEN—Tie Bars, Tie Tacs. See individual listings on this page. There are 12 different, Psychedelic Art patterns, bonded to rigid plastic:

(1) Sunburst, (2) Kaleidoscope, (3) Turning Gears, (4) Whirling Comets, (5) Bouncing Balls, (6) Swirling Cycloids, (7) Floating Bubbles, (8) Diamond Abstract, (9) Abstract Color, (10) Roaming Rectangles, (11) Spirals, and (12) Stripes. Wherever possible, colors are given.

ART PLAQUES

Pattern No.	Colors	Size	Stock No.	Price Ppd.
1	Red, yellow	8"x14"	70,912	\$3.50
2	Black, red, yellow, blue	14"x14"	70,911	6.50
3	Red, blue, green, white	14"x16"	70,913	6.50
4	Blue, white	8"x10"	70,914	4.00
5	Red, green, white	11"x14"	70,915	4.75
6	Red, yellow, blue, green, white	11"x11"	70,916	4.75
7	Black, red, white	10"x12"	70,917	4.75
8	Blue, yellow, red	10"x12"	70,918	4.75
9	Multi-colors	10"x10"	70,919	4.75
10	Red, blue, yellow, white	11"x17"	70,920	6.50
Asst.	Various, Pkg. of 10	2 1/2" diam.	P-60,657	4.00

EARRINGS

Pattern No.	Drop Style	Color	Disc Size	Stock No.	Price Ppd.
11	Double	(A) Pink, White	1"	1889	\$3.00
11	"	(A) Green, White	1"	1888	3.00
11	"	(A) Blue, White	1"	1887	3.00
8	Single	(C) Multi-Colors	1 3/4"	1886	3.00
12	"	(C) Red & White	2 1/2"	1885	3.00
12	"	(B) Red, White	1 3/4"	1883	3.00
8	"	(A) Multi-Color	2 1/2"	1884	3.00

(A) Pierced look (clip) (B) Pierced look (C) Pierced ears (screw back)

HAIR BOWS

Pattern No.	Colors	Approx. Size	Pkg. Of	Stock No.	Price Ppd.
5	Pink, green, white	1 1/2"x4 1/4"	2	P-1878	\$2.00
5	Pink, green, white	3 1/8"x6"	1	1879	2.00
3	Red, blue, green, white	1 1/2"x4 1/4"	2	P-1880	2.00
3	Red, blue, green, white	3 1/8"x6"	1	1881	2.00

HAIR CLIPS

3, 8	Various	2 1/2" diam.	2	P-1873	2.00
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PINS (Popular Colors)

Pattern No.	Disc Size	Quantity	Stock No.	Price Ppd.
3, 8	2 1/2"	Two	P-1874	\$2.00
12	2 1/2"	One	P-1875	2.00
2, 3, 11	1"	Three (Pkg. of 4)		

NECKLACE WITH PENDANT

2 1/2" diam. double sided pendant (pattern Nos. 8, 12; multi-colors, red and white stripe), with 27" gold color chain. **No. 1882 \$2.00 Ppd.**

TIE BARS

1 3/4" diam. disc. pattern No. 3, assorted colors pkg. of three. **No. P-1872 \$2.00**

2 1/2" diam. disc. pattern Nos. 4 & 8 pkg. of two. **No. P-1871 \$2.00**

TIE TACS

1" diam. disc. pattern Nos. 2, 3, 11 pkg. of four, assorted colors. **No. P-1877 \$2.00**

SEE LENTICULAR SCREEN MATERIAL, PAGE 19

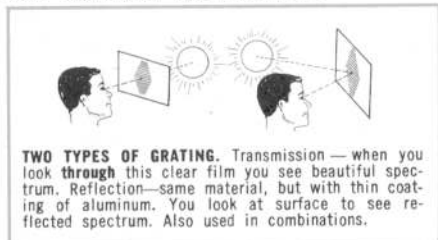
AMAZING MATERIAL SHOWS YOU ALL THE COLORS

JUST WHAT IS DIFFRACTION GRATING?

The passage of a system of light waves past the edges of an obstacle is accompanied by a phenomenon known as diffraction. White light is broken up into the colors of the spectrum . . . red, orange, yellow, green, blue, indigo, and violet.

Rulings of thousands of lines per inch have been made on glass to produce diffraction gratings. Replicas of these have been made for years, but until 1959 replicas cost about \$5.00 a square inch! And these were available only in small sizes. Now, we bring you film (acetate plastic) replica gratings at a very, very low price.

This material has 13,400 grooves per inch running the long way. It is $8\frac{1}{2}$ " wide with about $7\frac{1}{2}$ " covered with the replica lines. Thickness of the material is about .005". Dispersion of light is about 24° .



TWO TYPES OF GRATING. Transmission—when you look through this clear film you see beautiful spectrum. Reflection—same material, but with thin coating of aluminum. You look at surface to see reflected spectrum. Also used in combinations.

BEAUTIFY YOUR HOME & MANY THINGS IN IT

Decorative Uses. Tape a piece of transmission grating on your window. You'll be able to see out, and the sun will create a beautiful spectrum through the grating. Make large panels . . . sandwich either type grating between large sheets of glass or plastic for windows, wall panels, table tops, reflectors, skylights, background signs, etc.

Wheels that revolve, attention-getting rainbow wheels of various types, can be made for decoration, advertising displays, etc. "Gorgeous" is what people say about twinky lights in a black box with four-layer transmission grating in front. (Order the "Idea Book", below, for many other ideas.)

Educational Demonstration Tool. Diffraction grating has long been used in schools. Ours is so inexpensive you can give each student in art, science or physics class a piece. Excellent for Science Fair Projects, homemade spectrosopes, etc.

For The Photographer. Use in front of your camera lens and you can get unusual pictures filled with one or many rainbows. (See "Idea Book".) Reflect a rainbow of colors onto many subjects. Use in movie titles or slide backgrounds.

Experimental and Industrial. Employed for measuring, for spectrosopes, for testing resolving power of microscopes, etc.

Outstanding Jewelry. The circular pattern picks up light from all angles and gives you a dazzling and more colorful effect than even a diamond does. See page 45.

DIFFRACTION GRATING IDEA BOOK. Big 32-page book tells you all the many uses and how you can put the rainbow to work in—decorations, displays, photos, teaching demonstrations, etc. Paperbound, $8\frac{1}{2}$ " x 11".

No. 9064 Only 50c Ppd.



HUNDREDS OF PHOTO TRICKS

EXPERIMENTER'S AND DESIGNER'S KITS

For home experimenting and color photography. Kit contains: (1) one piece of transmission grating $8\frac{1}{2}$ " x $5\frac{1}{2}$ " long; (2) one piece of reflection grating $8\frac{1}{2}$ " x $5\frac{1}{2}$ " long; (3) 4 assorted, self-adhesive, circular patterned gratings; (4) a piece of double-faced tape; (5) two round pieces of glass for mounting; (6) Diffraction Grating Idea Book. **No. 70,563 \$5.00 Ppd.**

For researcher and idea men, for creation of new products. Same rainbow materials as above, but in larger quantities. Includes items: (1) and (2) in 24" lengths; 8 assorted pieces of item (3); plus items (4), (5) and (6). **No. 70,564 \$10.00 Ppd.**

CARD-MOUNTED DIFFRACTION VIEWERS

Transmission Type in 2" x 2" Mounts. These have 1 square inch of diffraction grating exposed.

No. 40,272 One slide only. **25c Postpaid**

No. P-30,282 Forty in plastic container. **\$4.50 Ppd.**

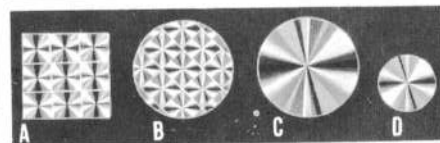
No. P-50,183 One-hundred in container. **\$10.00 Ppd.**

Rainbow Viewers. One piece of transmission and one of reflection grating in $1\frac{1}{2}$ " x 4" stereo mount.

No. 30,460 (One viewer) **50c Ppd.**

No. P-40,557 (Pkg. of Ten) **\$3.50 Ppd.**

No. P-40,558 (Pkg. of Fifty) **\$15.00 Ppd.**



NEW! SELF-ADHESIVE DIFFRACTION JEWELS

Make beautiful jewelry . . . pins, pendants, key chains, tie tacs, etc. . . and ornaments. Embellish countless household items. New $\frac{1}{4}$ " mosaic as well as circular patterns, all cut from circular-ruled, reflection-type gratings and silver colored. Tint them to any shade with fabric dyes available locally. And they still sparkle like the rainbow. All approx. 0.01" thick.

Item Size	Pkg. of 8	Pkg. of 100	Pkg. of 1,000
(A) $3\frac{1}{4}$ " x $3\frac{1}{4}$ "	P-40,942	P-60,599	P-70,852
(B) $7\frac{7}{8}$ " diam.	P-40,943	P-60,600	P-70,853
(C) $7\frac{7}{8}$ " diam.	P-40,944	P-60,598	P-70,851
(D) $1\frac{1}{2}$ " diam.	P-40,945	P-60,597	P-70,850
Assortment	P-40,946	P-60,601	P-70,854

\$2.00 Ppd. \$15.00 Ppd. \$100.00 Ppd.

Assortments include equal number of A, B, C and D.

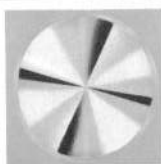
NEW! LARGER ($1\frac{7}{8}$ "-DIAM.)

DIFFRACTION GRATINGS

Use reflection type to make jewelry, mobiles, etc. Place transmission type (transparent) over camera lens for "rainbow photos." Pkg. of 2 replica gratings .0075" thick with 15,000 lines per inch, and idea sheet.

Reflection. No. P-40,849 \$1.00 Ppd.

Transmission. No. P-40,848 \$1.25 Ppd.

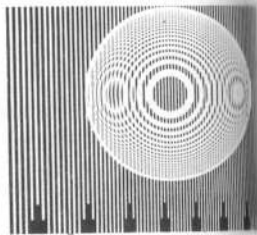
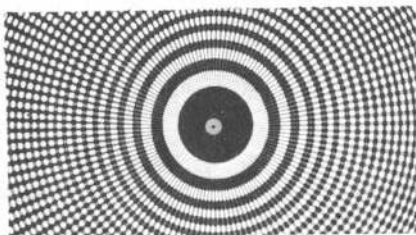


SHEETS AND ROLLS OF GRATING

All $8\frac{1}{2}$ " wide. Introductory package contains $8\frac{1}{2}$ " x 11" sheet plus 1-page idea sheet.

	Transmission	No.	Price, Ppd.	Reflection	No.	Price, Ppd.
Package		40,267	\$ 1.50		50,201	\$ 2.50
6-Ft. Roll		50,180	5.95		50,203	10.95
25-Ft. Roll		70,565	21.25		70,566	38.75
100-Ft. Roll		70,567	70.00		70,568	127.00

Combination. One sheet ($8\frac{1}{2}$ " x $5\frac{1}{2}$ " of each type, with idea sheet. **No. 50,202 \$2.00 Ppd.**
500-Ft. rolls available. Prices on request.



IT'S NEW! IT'S EXCITING! IT UNITES ONLY EDMUND OFFERS YOU THE OPPORTUNITY TO EXPERIMENT NEW MOIRÉ PATTERNS, KITS IN COLOR OR BLACK AND WHITE.

Dr. Gerald Oster, physicist at Brooklyn's Polytechnic Institute, was first to establish the importance of the moiré phenomenon with his articles in "Scientific American" and other leading publications. Realizing that important scientific ground had been broken and that a new tool of science and art had been unearthed; we had Dr. Oster write for us "The Science of Moiré Patterns" experiment manual. Under his guidance, we prepared inexpensive sets of patterns and accessory material. Each set, available in either color or black-and-white, contains 8 basic patterns which you can combine to produce an infinite variety of moirés.

Moiré patterns are produced by overlaying precise repetitive figures so that the line elements are nearly superposed. In the scientific disciplines of physics, mathematics and even psychology, moiré patterns offer FANTASTIC NEW OPPORTUNITIES. IMAGINE USING THEM TO—

- Inexpensively measure one part in a billion
- Reproduce math concepts visually, solve problems in physics
- Visually study liquid flow and stress lines in objects
- Excellent Science Fair Project, New field of visual psychology

Every researcher, product designer and developer, progressive artist and science fair participant should have a working acquaintance with moiré patterns. In the field of education, teachers and professors of math, optics, physics and psychology, art, engineering, etc. should experiment with and utilize them.

OP ART employs these moiré patterns in the creation of exciting two- and three-dimensional illustrations.

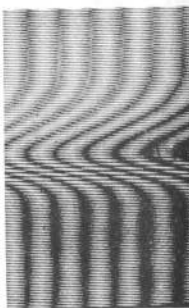
"THE SCIENCE OF MOIRÉ PATTERNS" By Dr. G. Oster

Written exclusively for Edmund Scientific Co., this new and authoritative experiment manual introduces you to moirés through interesting experiments. You need only an understanding of high school mathematics to enjoy it. And the experiments require only the materials listed in one of the Series (A) Black & White Kits and Accessory Kit listed at the right.

Here is a book that belongs in every industrial, high school and college library. Covers moiré in everyday life, the kits, screens, geometry, psychology, etc. 32 pages (8 1/2" x 11"). 25 illustrations. Unique acetate cover produces moiré patterns with motion.

No. 9068 \$2.00 Postpaid

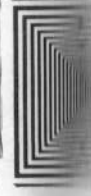
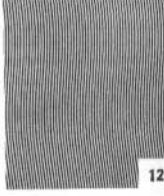
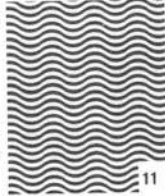
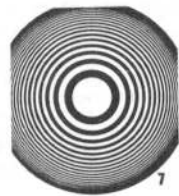
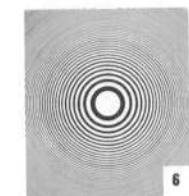
EXPERIMENT KITS in color or black-and-white are available in either Series (A) or Series (B) Patterns (illustrated at left and below). **Series (A) patterns include:** (1) Coarse grating, (2) 65-line grating, (3) Logarithmic scale grating, (4) Radial lines 5°, (5) Equispaced circles, (6) Fresnel zone plate, (7) Sphere projection, (8) Cylinder projection. **Series (B) patterns include:** (11) Coarse sines, (12) 65-line sines, (13) Perspective squares, (14) Medium grating, (15) Gaussian grating, (16) Converging circles, (17) Elliptical zone plate, and (18) 30-line logarithmic spiral.

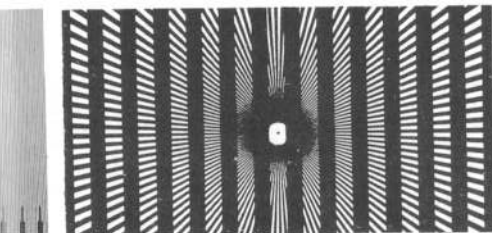


EXPERIMENTAL APPARATUS

for studying the diffusion of molecules in liquid. Light passes through cell (C) with two identical line rulings on walls; moiré pattern (M) is focused by lens (L) on screen (S).

Sensitive measurements of refractive index or index gradient can be made from changes in moiré pattern.





SCIENCE AND ART!

AT LOW COST WITH REVOLUTIONARY

BLACK AND WHITE KITS

Series (A)—Deluxe. 8 patterns produced on $3\frac{1}{4}'' \times 4'' \times .020''$ thick, clear vinyl and again on $3\frac{1}{4}'' \times 4\frac{1}{2}''$. Krome-coat paper (.012" thick, coated both sides). A total of 16 pieces, plus "The Science of Moiré Patterns"; two $3\frac{1}{4}'' \times 4''$, 150-dot halftone screens and one $8'' \times 10\frac{1}{2}''$, 20-mesh, fiberglass screen. **No. 70,719 \$8.50 Ppd.**

As above, but without text. **No. 60,464 \$6.50 Ppd.**
Series (A)—Standard. Same as deluxe kit but patterns are on lighter weight, .005" plastic and .010" Krome-coat (coated one side). Includes experiment manual and 1 halftone screen, but no fiberglass screen. **No. 70,718 \$6.00 Ppd.**

As above, but without manual. **No. 60,462 \$4.00 Ppd.**
Series (B)—Deluxe. Same materials as Series A deluxe kit except for Series B patterns and their instructions rather than experiment manual. **No. 70,790 \$6.00 Ppd.**

Deluxe Combination Kit. Both Series A and B Deluxe Kits. **No. P-70,791 \$14.00 Ppd.**
Moiré Pattern Accessory Kit. For use with Series A black and white kits to perform additional experiments described in Dr. Oster's text. Contains: balloon (approx. 12"); 1 each, 133 and 150-line Ronchi rulings on film; one-way mirror (on film); transmittance and reflectance diffraction gratings; red and blue filters; polarizing film; front surface mirror; cylindrical lens; PCX and negative lens; 1 piece calcite. **No. 60,487 \$8.00 Ppd.**

COLOR KITS

With these Deluxe Color Kits you produce secondary color effects and an endless variety of moiré patterns. Each kit includes 8 patterns with each individual pattern in 3, different, transparent colors (magenta, yellow and cyan) on 3 clear plastic sheets. For each pattern there is also a black-and-white opaque print, plus a solid black image on clear plastic. A total of 40 impressions on ten, $7\frac{1}{2}'' \times 9\frac{1}{2}''$ sheets. Instructions.

Series (A)—Deluxe **No. 60,530 \$12.50 Ppd.**
Series (B)—Deluxe **No. 60,531 \$12.50 Ppd.**

For Experimenters With Limited Budgets—Pattern (4) on 5 sheets; 3 in primary colors and 2 in black.

No. 40,821 \$2.00 Ppd.

LARGE BLACK & WHITE PATTERNS

$8\frac{1}{2}'' \times 11''$ Size. Create your own op art and mobiles. Sixteen $8\frac{1}{2}'' \times 11''$ pieces in all; 8 patterns on .005"-thick transparent plastic and again on .010"-thick Krome-coat.

Series (A). **No. 60,532 \$18.50 Postpaid**
Series (B). **No. 60,541 \$18.50 Postpaid**



Renowned artist Salvador Dali comments on Dr. Gerald Oster's "Jagged Log Major." Dr. Oster at right.

Individual Patterns. One transparency, one proof.

Pattern	Stock No.	Price	Pattern	Stock No.	Price
(1)	60,533	\$2.50	(11)	60,542	\$2.50
(2)	60,534	2.50	(12)	60,543	2.50
(3)	60,535	2.50	(13)	60,544	2.50
(4)	60,536	2.50	(14)	60,545	2.50
(5)	60,537	2.50	(15)	60,546	2.50
(6)	60,538	2.50	(16)	60,547	2.50
(7)	60,539	2.50	(17)	60,548	2.50
(8)	60,540	2.50	(18)	60,549	2.50

Giant $20'' \times 25''$ Size. For op art, displays and exhibits. Perfect for store windows, advertising displays, for schools, home and industry. Each on .010" clear plastic and again on .012" Krome-coat. Enlargements have fewer lines per inch. (Pattern 2 has 27 lpi in $8\frac{1}{2}'' \times 11''$ size, 11 lpi in $20'' \times 25''$ size.)

Pattern	Description of Set	Stock No.	Price, Ppd.
(2)	Straight-line grating	70,792	\$11.50
(4)	Radial lines 5°	70,793	11.50
(5)	Equispaced circles	70,794	11.50
(13)	Perspective squares	70,795	11.50

*** $20'' \times 25''$ Transparency Only.**

Pattern	No.	Price, Ppd.	Pattern	No.	Price, Ppd.
(2)	70,796	\$6.50	(5)	70,798	\$6.50
(4)	70,797	6.50	(13)	70,799	6.50

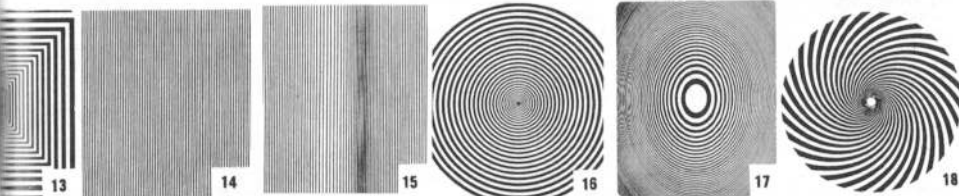
Moiré Patterns on $3\frac{1}{4}'' \times 4''$ Photo Negatives. Make your own photo prints. Intense blacks give crisp, clear reproduction. Buy both sets to get all possible printing combinations. Excellent for overhead projectors.

Series (A). **No. 40,822 \$19.00 Postpaid**
Series (B). **No. 40,823 \$10.00 Postpaid**

"Experimental Stress Analysis with the Moiré Fringe Method." Fully illustrated, 8-page reprint from "Product Engineering." **No. 9075 35¢ Postpaid**

"Optical Art" by Dr. G. Oster. Reprint from "Applied Optics". 11 pages. Traces historical origins and discusses various aspects of optical art. **No. 9079 75¢**

Edmund Halftone Screen Determiner For moiré experiments and graphic arts. Double-sided. Identifies number of lines per inch (50 to 200). Also has inch, mm, agate and pica rules. Measures stereotype shrinkage plus screen angles for color. Durable plastic sheet, $5''$ sq. **No. 40,751 \$2.25 Ppd.**





NEW MODELING PLASTIC STAYS SOFT UNTIL BAKED

- Colors easily
- Non-toxic
- Self structuring

Designers and model-makers, prepare product designs easily. Eliminate worry about premature hardening or drying out. New white, "plastic" material stays soft indefinitely. It is smooth, non-sticky, non-toxic, and self-structuring. Does not stain or stick to skin. Baked at 300°F (use kitchen oven) for 15-30 minutes, (no kiln or plaster molds necessary.) Plastic acquires a permanent, non-brittle hardness. Surface changes or repairs easily made with fresh plastic... bake to harden. No curing required, and it won't shrink. Baked forms can be sanded, carved and drilled. Harmless, non-toxic—easy to color with oil or water paint. Instructions incl.

3 lb. Package **No. 60,656 \$4.50 Ppd.**
10 lb. Package **No. 70,909 \$11.50 Ppd.**

NEW 8" TRANSPARENT ADJUSTABLE TRIANGLE

Trace any angle from 0° to 90°. Graduations of arc are so calibrated that inner row of figures gives degrees of one angle and outer figures give degrees of complementary angle. Body of eye-ease plastic has 1/2", 3/4", 1", 1 1/4" circular openings and tapered holes 1/4" apart. Weight boxed 5 1/4 oz. **No. 70,789 \$3.00 Ppd.**



NO MESS PAPIER MACHE

Ideal for modelling maps, models, railroad layouts, masks. New mix ends all the mess and trouble of preparation. Just mix one quart water to one pound of powder, knead to the consistency of dough and use. Non-toxic, clean and odorless. Finished work can be drilled, sawed or sanded, painted or weatherproofed.

5-pound package **No. 70,410 \$3.90 Postpaid**
10-pound package **No. 70,411 \$6.00 Postpaid**

See Artist's Reducing Glass, 73; Geo. Solids, 40, 41.

OPTICAL DRAWING DEVICE

A half-silvered mirror or beam splitter, cemented to a right angle prism, enables you to construct tangents and normals to curves easily. Extremely useful in analysis of graphed data. Mirror measures 3 3/16 x 2 5/8 x 3/16" thick. Instructions. **No. 50,226 \$5.00 Postpaid**



MALE MANIKIN

Assumes and holds any pose. Fully jointed. Carved from fine-grained wood. Measures full 12" high.

No. 60,251 \$5.35 Ppd.

CAMEL HAIR BRUSHES

For watercolors, photo retouching, gluing, etc. Each set includes 6 standard artist's brushes Nos. 1 through 6. With 7" handles. Twenty-four sets (144 brushes).

No. P-70,348 \$5.00 Ppd.

Twelve sets (72 brushes).

No. P-50,326 \$3.00 Ppd.

Four sets (24 brushes).

No. P-60,085 \$1.40 Ppd.

Create and decorate with MOIRE Patterns. Kits now available in COLOR, also large display size patterns—SEE PAGES 22 and 23.



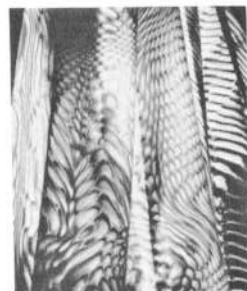
Makes drawing truly easy

FASCINATING MIRROR LUCIDA OPTICS KIT

Without the years of training required, by the use of this wonderful, build-it-yourself instrument, you can make professional-looking, three dimensional drawings.

Actually invented about 1804, the Camera Lucida seems to project an image onto the drawing board where it can be drawn with a pencil. This kit includes a war-surplus beam splitter mirror, a first surface mirror and complete directions. Just supply the scrap cardboard, metal or wood for the box and stand. Instructions included.

No. 40,677 \$4.75 Postpaid



MULTI - LENSED THERMOPLASTIC SHEETING

10,000 Parabolic Lenses Per Sq. In. . . . For Moiré Experimenters, Designers, Etc.

Unlaminated sheeting, especially suited for moiré studies, is translucent and clear, .0075" thick, 12" x 24". When smooth surface of one sheet is placed against that of another, floating or sinking moirés can be produced, shimmering patterns of endless variety. Artists will find the random moiré effect produced by the laminated sheeting an unusual starting point for expressionistic design. Salvador Dali and other artists, intrigued by its possibilities, have made it the "canvas" for dimensional paintings as well as for collage effects.

Can be used with a wide variety of adhesives, resists soiling, can be cleaned readily with mild detergent. Accepts art work, silk screen printing or quality lithography with excellent results. Floating or sinking patterns give an illusion of depth up to 3/4"—art or type appears to float above the surface, or sink deeply into it.

Unlaminated Sheet. 12" x 24". **No. 70,734 \$2.00 Ppd.**

LAMINATED SHEETS.

Floating, concave pattern. Translucent and clear.

(12" x 27". **No. 70,731 \$3.25 Ppd.**)

Floating, concave pattern. Vacuum-metalized back; chrome-colored.

(12" x 27". **No. 70,732 \$4.25 Ppd.**)

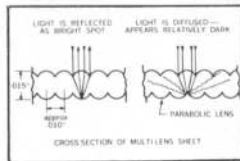
Sinking, convex pattern. 3-D. Vacuum-metalized back; med. blue chrome.

(12" x 27". **No. 70,733 \$4.25 Ppd.**)

(24" x 54". **No. 70,728 \$10.50 Ppd.**)

(24" x 54". **No. 70,729 \$13.75 Ppd.**)

(24" x 54". **No. 70,730 \$13.75 Ppd.**)



HALFTONE SCREEN . . . 150 DOTS PER INCH. Excellent for moiré experiments and special photographic effects. Big 20" x 24" screen suitable for printing and graphic arts industry. Precision quality, on .007" thick acetate. "E" value (density 40%). Shipped in tube. **No. 70,708 \$10.00 Postpaid**

Start Your Own Science Collection

Formerly if you spent your time collecting match covers, coins, picture cards, etc., what did it matter? Today it does matter! Today we need to use our time for fun and for learning too. Spend hours of enlivening, educational fun by collecting small scientific items.

INDIVIDUAL COLLECTOR'S ITEMS

PETRIFIED WOOD. Especially fine pieces, large and clearly defined. Unpolished . . . shows detail.

	No. 60,121	\$1.25 Ppd.
Fern.	No. 40,465	1.25 Ppd.
Fish.	No. 40,464	2.25 Ppd.

THREE FOSSIL COLLECTIONS. 10 interesting examples of animal and plant life from Cretaceous, Jurassic, Pennsylvanian ages.

Carboniferous Set. 10 excellently preserved specimens (approx. 1" diam.). Brachiopod, worm burl, crinoid stem, etc.

No. 40,387 \$1.25 Ppd.

Cretaceous Set. Nine animal fossils and one piece of petrified wood from the Lower Cretaceous period, 120,000,000 years ago.

No. 40,386 \$1.25 Ppd.

ALL THREE SETS ABOVE. No. 50,344 \$3.75 Ppd.

NEW! TRILOBITE IN MATRIX. Exquisite specimen of this extinct marine arthropod from the Cambrian Period (450 million years ago).

No. 40,806 \$1.50 Ppd.

LODESTONE . . . NATURAL MAGNET. Large, selected specimen of magnetic iron ore. It is not a "chip," but full size specimen.

No. 40,471 \$1.00 Ppd.

NEW! INDIAN ARROWHEAD. Authentic, sharply defined sample approx. 1½" long.

No. 30,555 \$1.00 Ppd.

NEW! CIVIL WAR BULLET. From the Gettysburg battlefield. In plastic box.

No. 40,805 \$1.00 Ppd.

NEW! POWERFUL LITTLE CERAMIC MAGNET. Weighs 2.2 ounces, measures 1½" x 7/8" x 3/8"—yet it exerts a 40-POUND PULL! Supplied with two pole pieces which increase holding force 8 TIMES!

Pkg. of two. No. P-40,818 \$1.40 Ppd.

PRISM SET KK-1. Set of 8 war-surplus prisms. Government paid over \$100.00. If you purchased them individually they would cost about \$10.00. Various sizes and types such as: porro, roof, pentagon, etc. Precision pieces.

No. 60,407 \$5.00 Ppd.

GEM CASE. 3½" x 7" x ¾" plastic case contains 12 polished, semiprecious gem stones. Includes rose quartz from S. Dakota; rhodonite, California; amethyst, Brazil; tiger's eye, Africa, etc.

No. 60,404 \$1.00 Ppd.

MINERAL HARDNESS TABLE. Compares hardness of 10 different carded minerals. With talc as reference (0 hardness). All in 5½" x 2¼" x ¾" plastic case. Diamond, topaz, quartz, etc.

No. 40,687 \$2.00 Ppd.

NEW! METEORITES! EXTRA LARGE SPECIMENS

Every science enthusiast should have a classified sample of matter from outer space. These fell approx. 27,000 years ago in the Canyon Diablo area of Arizona. Composed of 92% iron, 7% nickel and 1% minute traces of other elements. Siderite class with classification card.

Stock No.	Size	Approx. Wt.	Price Ppd.
40,809	Small	Under ¼ oz.	\$ 3.00
40,979	Small	¼-½ oz.	15.00
40,978	Medium	½-¾ oz.	25.00
40,977	Large	1-1½ oz.	35.00
40,976	Jumbo	2 oz. and up	45.00

TEKTITES FROM THAILAND. Believed to be of meteoritic origin. Hard and somewhat brittle, they look like dark brown opaque glass.

No. 40,621	One piece, approx. ¼"	\$1.00 Ppd.
No. 40,620	One piece, approx. ½"	1.50 Ppd.
No. 40,609	One piece, approx. ¾"	2.00 Ppd.
No. 40,647	One piece, 1" or more.	4.50 Ppd.

LARGE (2" AND OVER) TEKTITES. From Thailand. Some of the best specimens obtainable anywhere; at least 2" in one dimension. In plastic collector's box.

No. 40,888 Each \$20.00 Ppd.

COLLECTOR'S STARTER SETS

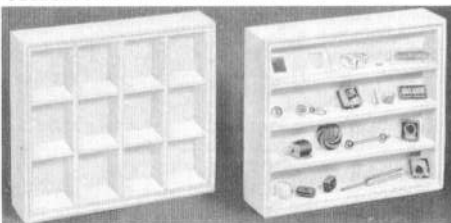
Basic Shelf Starter Set. Eleven science miniatures: 1) Diffraction Grating Rainbow Viewer. 2) 90° Optical Glass Prism. 3) Four Ceramic Magnets. 4) Optical Illusion-Hypnotism Disc. 5) Small Magnetic Compass. 6) 3" Twister. Toy used for therapy, design and creative craft work. 7) Four Plastic Collector's Specimen Boxes. 8) Prehistoric Shark's Tooth. 9) 20-X Magnifying Lens. 10) Plano-Concave Lens. 11) Brazilian Quartz Crystal. 12) Centrifugal Force Puzzle. Items 1-12 with facts on each.

No. 70,744 Only \$5.00 Postpaid

Deluxe Shelf Starter Set. You get all of the items in the Basic Set described above, PLUS: 13) Tektite from Thailand. 14) Static Electricity Demonstrator. 15) Tuning Fork. 16) Burning Glass Lens. 17) Mercury Puzzle. 18) Transparent Front Surface Mirror. 19) Multi-Lensed Thermoplastic Sheet. Two 2"-sq. pieces, each with 40,000 parabolic lenses. Items 1-19 with facts on each.

No. 70,745 \$10.00 Postpaid

COLLECTOR'S PLASTIC SHELVES AND TRAYS



Versatile Display Shelves, Trays, Drawers of Expanded Polystyrene. Whatever you collect, here is a masterful way to display it, in these low-cost, lightweight units. Precision molded in one piece. Won't warp, rot or discolor. Smooth white skin is easy to clean. Two styles: **Tray (A)** has 12 (2½" x 2½" x 2½") compartments; **Tray (B)** has 4 (10½" x 2½" x 2½") compartments. Both 10½" x 11½" x 3" overall. Wt. each only 4½ oz.

Style (A). One tray with sleeve (just like a drawer).

No. 70,803 Only 98¢ Ppd.

Pkg. of 6 trays (no sleeves) No. P-80,090 Only 98¢ Ppd.

Style (B). One tray with sleeve. No. P-80,804 Only 98¢ Ppd.

Pkg. of 6 trays (no sleeves) No. P-80,091 \$4.98 Ppd.

Combination Offer. Three of each style (no sleeves).

No. P-80,092 \$4.98 Ppd.

Transparent Clear Plastic Tray Cover. Rigid sheet 11½" x 9½" x 1/16".

No. 60,554 \$1.98 Ppd.

Metal Hardware for Adjustable 4" Shelves. Two 18"-long standards and 8 snap-type shelf brackets. Slotted standards allow you complete adjustment of shelf spacing. Silver satin finish. (Your lumber yard can cut attractive wood shelves . . . sand, stain or cover to suit.) Hardware only.

No. 70,743 \$4.00 Postpaid

TRINITITE SPECIMENS. Glazed, greenish fused sand formed by intense heat of first atomic bomb (Project Trinity) exploded at New Mexico July 16, 1945. Similar to Fulgarites formed when lightning strikes sandy soil, non-radioactive.

Specimen 1" or larger.

No. 40,877 \$2.50 Ppd.

Specimen ¾" to 1".

No. 40,881 \$1.50 Ppd.

SEE AND LEARN MINERALS SET. 20 carded minerals with complete descriptions, sources, uses, hardness scale and specific gravity. A marvelous learning aid. Includes such specimens as satinspar, pyrite, hexagonite, bauxite, obsidian, asbestos, galens, talc, mica, etc. Box size 7" x 9¾" x ¾".

No. 70,663 \$1.25 Ppd.

DEMONSTRATE STATIC ELECTRICITY. Pocket-size Static Electricity Demonstrator. Fun for your collection shelf and a fascinating teaching toy for children . . . safe, won't shock.

No. 40,714 69¢ Ppd.

SCIENCE PROJECTS

PROJECT KITS FOR: Science Fairs, Future Scientists of America, Junior Academy of Science, Junior Engineering Technical Society



EXPERIMENTAL OPTICS KIT

Perform dozens of experiments and demonstrations in optics. This kit includes 10 assorted lenses (they have small edge chips or other minor flaws, but are perfectly usable for project work) and a 16-page project book. You get 5 additional double convex lenses, a prism and a diffraction grating for studying spectra, 2 polarizing filters for making a polariscope, a rotating Star Finder chart with instructions, a $2\frac{1}{2} \times 1\frac{1}{4}$ " magnifier and 2 other illustrated project books.

No. 50,204 \$3.50 Postpaid

UNBREAKABLE AQUARIUM

A sturdy, $2\frac{1}{2}$ gallon plastic aquarium for interesting class projects. Has reflector and standard bulb socket, 6-ft. electric cord and switch.

No. 90,014 \$8.95 Ppd.



OPTICAL ILLUSIONS KIT

Optical illusion diagrams, mirrors, lenses, beam splitter mirror, other materials plus instructions for producing

illusions and for building a kaleidoscope, stereoscope and a "magic box." **No. 70,352 \$3.00 Ppd.**



Probe the strange properties of polarized light — ASSEMBLED POLARIMETER

- Excellent instrument for Science Fair Projects
- For demonstration and lab work with polarized light

Can be used for inspection of small glass and plastic parts for internal strains. Includes polacoat filters set in 4" O.D. calibrated rings on 4×5 " base. Test specimens, double-refracting calcite crystal and 10 experiments included.

No. 70,505 \$9.95 Ppd.

Polarized Light Experiment Kit. All the instructions and materials for dozens of experiments on the properties of polarized light . . . polarizing filters, mica, quartz, stress specimen, etc. **No. 70,506 \$6.00 Ppd.**

SWITCH FROM BATTERIES TO HOUSE CURRENT FOR PHOTO FLASH, ETC.

Well-built, 3-volt AC transformer is excellent for powering flash guns, flashlights, Foucault testers and many devices utilizing 3-volt lamps. Removable 110-volt AC house current. 36" cord with plug is equipped with 3mm-diam. phono jack. Heavy-duty, gray plastic case measures $1\frac{3}{4} \times 2\frac{1}{2} \times 1\frac{3}{4}$ " high. Wt. only 5 oz. Instructions for photo use incl. **No. 60,379 \$2.50 Ppd.**



CRYSTAL GROWING KIT

Do a crystallography project and illustrate with large beautiful crystals you grow yourself. Kit includes the book "Crystals and Crystal Growing" by Holden and Singer, plus a generous supply of the chemicals you need to grow large display crystals of: potassium aluminum sulfate (clear), potassium chromium sulfate (purple), potassium sodium tartrate (clear), nickel sulfate hexahydrate (blue green) or heptahydrate (green), potassium ferricyanide (red) and copper acetate (blue green).

Study and demonstrate factors affecting growth, refraction in crystals, the piezoelectric effect, crystal symmetry, etc. We suggest you illustrate the structure of the crystals you grow with models made from our Molecule and Crystal Models Kits described and listed on page 29. Complete crystal kit.

No. 70,336 \$9.50 Ppd.

COMPLETE SPECTROSCOPE KIT

Do experiments, research, and demonstrations in the important science of spectroscopy using the instrument you make with this kit. It includes two achromatic objective lenses, a plano-convex lens, a 2×2 " replica diffraction grating slide, film reticle and slit, all other parts needed. Complete directions included.

No. 50,237 \$8.50 Ppd.

LOW-PRICED, GRAM-OUNCE SCALE



This fine gram-ounce scale is unusually accurate for an instrument in this price range. It can be particularly valuable for home experiment. Scale is made of polished stainless steel and aluminum, calibrated in ounces from 0 to 16 and in grams from 0 to 450. Weighing pan measures $3 \times 2\frac{1}{4}$ ". Overall height is $5\frac{1}{4}$ ".

No. 90,053 \$6.65 Ppd.

INEXPENSIVE, LABORATORY-TYPE BALANCE



This balance will hold up even under hard student-usage. Weighs materials from 100 milligrams to 100 grams. Can be used for proportions. Removable plastic pans, 60mm in diam. Base is of rugged cast iron. One piece beam with balancing adjustment.

Overall height: $5\frac{1}{2}$ ", 7" long. Complete with set of 12 weights ranging from 100 mg. to 50 g., tweezers and wooden box. From Japan.

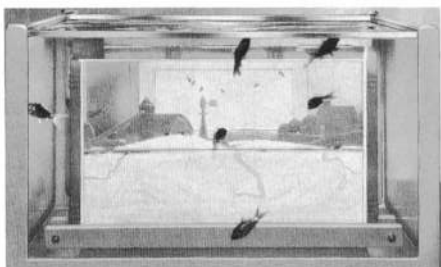
No. 70,443 \$17.50 Ppd.

LIVING UNDER WATER!

You can be one of the first to experiment with this New Silicone Rubber Membrane—lets oxygen pass in, lets carbon dioxide out, BUT DOESN'T LET WATER THROUGH! (Hand made in this laboratory size for Edmund Scientific's customers.)

An Underwater Ant Nest. Use this revolutionary membrane to show insects can be sealed off from air and still live and breathe normally by obtaining oxygen from water. **Here's How It Works:** Ant nest with membrane is placed in filled aquarium. As ants consume oxygen the partial pressure of the oxygen inside the nest is reduced below that of the oxygen pressure in the water—and oxygen enters through the membrane. As ants produce carbon dioxide, its pressure inside rises and it passes out. But water can't pass through!

Durable plastic ant nest (No. 70,800 described at right) comes complete with sand, food, certificate for supply of live ants. Purchase our 2½-gallon aquarium listed separately (full description on page 26), or use your present aquarium. The 3"x5" silicone rubber membrane has a dacron mat bonded to one side for mechanical strength. Thickness .001".



Underwater Ant Nest as described, 3"x5" Membrane, instructions. **No. 70,801 \$8.75 Ppd.**

Plastic Aquarium for above. See full description on page 27. **No. 90,014 \$8.95 Ppd.**

Ant Nest only. See separate listings below.

Bonded Silicone Rubber Membrane only, 3"x5". Full instructions included. **No. 40,824 \$5.75 Ppd.**

SURPLUS! MINIATURE D.C. MOTOR W/GOVERNOR



Special Sale! New, well made electric motors for science projects, experimenters and research. Designed for movie cameras. Has clockwise rotation, 2600 RPM with 5% regulation, operates on 4.5-6 volts DC. Color coded leads. Shaft 3/16" diam. x 1 1/2" long. Measures overall 1 1/4" diam. x 2 3/8" long. Two 1/8" mounting holes.

No. 41,064 \$1.00 Ppd.

Select Nickel-Cadmium Cells and Batteries to power your Science projects. See range of sizes and charging units, pages 13 and 52.

WATCH ANTS WORK IN GIANT-SIZE ANT NEST



Watch these hard-working patient engineers build rooms and subways. See them sow, reap, harvest and store food. Heavy, unbreakable plastic 10"x15" case. With sand, year's supply of food, ant watcher's manual and

certificate for supply of live ants. Excellent classroom fun.

Giant-Size Ant Nest. **No. 70,295 \$6.95 Ppd.**

Small-Size Ant Nest. As above, but 6 1/4"x8 1/2".

No. 70,800 \$3.00 Ppd.

"THE ANTS" . . . by Dr. Wilhelm Goetsch. About castles, labor, communications, etc. Paperback, 169 pages. (5 3/8"x7 7/8"). **No. 9351 \$1.95 Ppd.**

ATOMIC GARDENING KITS

Study amazing growths. You get 6 packets of either flower or vegetable seeds irradiated by Cobalt-60. May produce plants with rapid growth, early maturity, superior survival, astonishing mutations. Instructions included.

Flower Kit. Marigold, Zinnia, Morning Glory, Petunia and Aster. **No. 60,265 \$1.98 Postpaid**

Vegetable Kit. Tomato, Corn, Squash, Watermelon, Carrot and Pepper. **No. 60,266 \$1.98 Postpaid**

EDMUND'S FAMOUS ELECTROSTATIC GENERATOR

The electrostatic generator coupled with ion acceleration will provide the propulsion system when man goes beyond the near planets to the outer reaches of the solar system. Study it.

At educational conventions, many science teachers have told us this model is more rugged than bigger \$50 units. High priced versions have been used in schools for decades. Scientifically known as the Wimshurst Static Machine, or Influence Machine, used for many experiments.

Turn the handle and the two 9" plastic discs rotate in opposite directions. Metal collector brushes store static electricity in the Leyden jar condenser till discharged. Includes discharger, 2 luminous plates, jingle bell, dancing balls, lightning rod, 2 electric whirls, 14" high. Instructions. **No. 70,070 \$12.95 Ppd.**

See Van De Graaff Generator . . . page 43.



ATOMIC ENERGY LAB KIT WITH CLOUD CHAMBER

Build your own atomic energy laboratory complete with atomic cloud chamber, projector illuminator, electroscope and spinthariscopes. Create cosmic ray showers and actually track their vapor trails in the cloud chamber. See exploding atoms with the spinthariscopes. Make auto-radiographs. Check ionization and radioactivity of everyday materials and the included alpha source and uranium ore. Completely safe! Experiment with the wonders of nature. A perfect educational gift to arouse and stimulate scientific interest. Great for science projects. Complete kit includes 43 parts to construct the above apparatus plus a 22-page instruction booklet with 8 suggested experiments and the theories behind them.

No. 70,899 \$8.75 Postpaid



SOIL TEST KITS WITH INSTRUCTIONS

Use these kits as the basis of an exhibit or for making tests in any science project involving growing plants. Contains the solutions necessary for numerous tests for nitrogen, phosphorus, potash and pH. Also includes color card for interpreting tests, indicator papers for testing pH, four test tubes. Instructions show methods of adjusting soil chemistry, and chart pH references of common flowers, grasses, vegetables, trees, vines, shrubs.

Starter Kit. For 4 analyses. **No. 60,118 \$2.00 Ppd.**

Larger Kit. For 10 analyses. **No. 70,406 \$6.95 Ppd.**

Deluxe Kit. For 25 analyses. **No. 70,405 \$9.95 Ppd.**

SCIENCE PROJECTS



SCIENCE TREASURE CHESTS

**IDEAL GIFTS FOR SCIENCE-MINDED BOYS AND GIRLS
OF ALL AGES ... EXCELLENT SCIENCE FAIR "PROJECT MATERIAL"**

**Standard Size
Treasure Chest \$5⁵⁰ Ppd.**

**Deluxe, Extra-
Large Chest \$10⁵⁰ Ppd.**

Worlds of fun and excitement for any youngster of elementary, junior high, or high school age. Will give them increased understanding of the science they are studying at school. Each chest includes clear, easily-followed directions for doing dozens of scientific experiments plus instructions for building many useful scientific instruments with the materials included.

STANDARD SIZE SCIENCE TREASURE CHEST

In this one exciting package are included all of the following useful, scientific materials: (1) two extra-powerful, Alnico V magnets; (2) a lodestone; (3) magnetic compass; (4) prism; (5) diffraction grating for experimenting with the spectral colors of the rainbow; (6) book of litmus paper for testing acidity and alkalinity of common substances; (7) polarizing filters for making a polariscope and for studying the beautiful effects of polarized light passing through transparent materials; (8) an intriguing puzzle that demonstrates the power of centrifugal force; (9) a 1-ft. long fiber optic light guide with 16 plastic fibers; (10) a half-aluminized film for "one-way-mirror" effects; and (11) an assortment of 10 lenses to make magnifiers, telescopes, microscopes and other fascinating optical instruments. Complete with directions.

No. 70,342 \$5.50 Ppd.

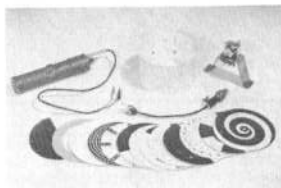


DELUXE SCIENCE TREASURE CHEST

This chest includes everything in the regular \$5.50 chest plus a wealth of additional scientific materials such as (12) a crystal growing kit for producing large, showy crystals of two distinct types; (13) a 15" circular slide rule; (14) battery operated electric motor for driving small mechanisms; (15) our special air-puck balloons for studying and demonstrating the air-glide principle; (16) kit for making molecular and crystalline models; and (17) 50X, pocket microscope for all kinds of inspection. . . can even be adapted for photomicrography. Complete instructions included.

No. 70,343 \$10.50 Ppd.

WHIRLING WONDERS PROJECT KIT FOR SCHOOL, INDUSTRY AND HOME RESEARCH



These whirling discs also have tremendous possibilities for new and different advertising displays. Like waving a magic wand, you see colors in black and white discs, see shapes change before your eyes, even see objects that aren't there. These "after images" are optical illusions that are produced by rotation or whirling motion. In addition, with this kit you can demonstrate how a stroboscope stops motion, how cones of sound can be produced.

Show the effects of off-center motion. Demonstrate how the pioneer "movies" of the Gay 90's were done. Even demonstrate hypnotism.

Kit includes 13 discs, each approx. 5" in diam., a battery holder with built-in rheostat, a small battery-operated motor mounted on bracket, bulb, socket and plug. Experiments and directions.

No. 70,414 \$9.95 Ppd.

Discs Only. Use with small variable control motor, kitchen mixer or electric drill. No motor or battery holder.

No. 70,424 \$3.50 Ppd.



HAVE FUN WITH SCIENCE OF SOAP BUBBLES

Create endless complex shapes, study and enjoy their fascinating behavior. Learn about liquid skins, pressures, jets, electrical conduction and the membrane theory of stress distribution. Chemist designed kit includes special, longer-lasting, lower-cost bubble formulation (makes several gallons). Sticks with poly connectors and wire bending jig to make bubble frames, plus 190-pg. book on subject by C. V. Boys. Complete instructions.

No. 70,742 \$6.00 Ppd.

Formulation only. **No. 40,782 \$3.00 Ppd.**

PRESERVE INTRICATE BEAUTIES of SNOWFLAKES



You can collect a gallery of art with every snow flurry . . . a fascinating winter hobby. Catch and study these delicate crystals that have

long mystified and intrigued scientists. With this kit you can preserve countless intricate patterns for study in lab, classroom or at home. Includes 1 1/4 oz. of preservative, glass rod, magnifying lens and full directions.

No. 40,530 \$2.00 Ppd.

"Snow Crystals" by Bently and Humphries. More than 2,450 photographs of actual snow crystals. Valuable for students of art, decoration and design. Describes problems and photographic techniques. 228 pages (8"x10 1/4").

No. 9352 \$3.25 Ppd.

"700 SCIENCE EXPERIMENTS FOR EVERYONE" ... BOOK COMPILED BY UNESCO

For boys and girls from grade school to high school. Tells how to create a cloud in a bottle, weigh the atmosphere, plant a bacteria garden, etc. Many of the experiments require only things found in the average home. Hardbound, 200 pages (6" x 9 1/2").

No. 9301 \$4.00 Ppd.

CADMIUM SULPHIDE PHOTOCCELL

This is a light-sensitive resistor, rather than a cell which generates electricity. Typical uses are to turn lights on in the evening, operating relays to open doors, count traffic, burglar alarms, etc. Measures 1 1/8"x1 1/8"x 3/16". Operates on 110 volts, AC or DC. Maximum power dissipation of cell, 0.2 watt. Resistance is 200 OHM to 1.5 Megohm, depending on illumination.

No. 60,222 \$2.35 Ppd.

Closed Molecular Model Kit

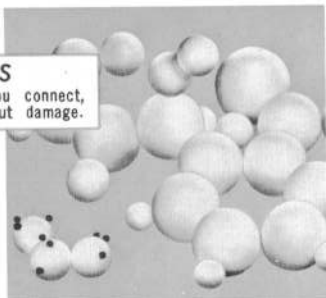
LOOK! BIG IMPROVEMENT IN ATOM CONNECTORS



Double-pointed, metal dowel screws let you connect, take apart and reconnect foam atom without damage.

For teaching, for lab or science fair project. This is the first closed-type molecular model kit that's really economical, really convenient. See illustration at right. New connectors won't pop, break or rust. New molded balls of expanded polystyrene have extra smooth surface. Extremely lightweight and firm . . . resist pressure, will not flake. Can be used over and over, can be colored, can be cut with knife. Complete kit includes 100 balls: 30 (.50"), 5 (1"), 10 (1.43"), 30 (1.56"), 3 (1.87"), 8 (2"), 8 (2.31"), 3 (2.5"), 1 (2.87"), 1 (3") and 1 (3.87"); plus 80 (1") connectors, 20 (1½") connectors, 50 red and 50 black map marking pins for representing electrons. With instructions.

No. 70,771 \$12.00 Ppd.



MODEL PARTS FOR CLOSED CRYSTAL STRUCTURES

Order No.	Item	Price Ppd.
One P-70,756	100 (1.25") Polystyrene Balls	\$2.60
Two P-40,842	50 (1.00") Atom Connectors	2.50
One 9076	"How To Build Foam Ball Atoms, Molecules and Crystals"	50¢

INDIVIDUAL PLASTIC FOAM BALLS. Order from table **Expanded Polystyrene.** Molding gives extra smooth surface to these extremely lightweight balls for molecular models. Firmer, resist pressure, will not flake. Can be used over and over again or can be cut with a sharp knife. **Styrofoam.** Lightweight and attractive . . . porous surface. Either type can also be used for attractive table decorations, solar system representations, etc.

Atom Connectors. Described above.

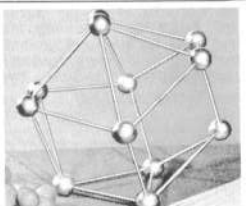
1" size (pkg. of 50).	No. P-40,842	\$2.50 Ppd.
1½" size (pkg. of 50).	No. P-40,843	\$2.50 Ppd.
Black "Electron Pins" (50).	No. P-40,801	60¢ Ppd.
Red "Electron Pins" (50).	No. P-40,800	60¢ Ppd.
"Teaching Chemistry With Models." By R. T. Sanderson, Professor of Chemistry, University of Iowa. Gives genuine understanding of atom and molecular models. Data for constructing 400 individual compounds plus familiar crystal structures. 54 photos, 24 in full color! Hard-bound, 175 pgs. (6"x9").		
	No. 9070	\$5.75 Ppd.

Expanded Polystyrene				Styrofoam		
Size	Pkg. of	Stock No.	Price Ppd.	Pkg. of	Stock No.	Price Ppd.
.50"	100	P-70,752	\$2.30			
.75"	100	P-70,753	2.35			
.87"	100	P-70,754	2.40			
1.00"	100	P-70,755	2.50	100	P-70,516	\$2.50
1.25"	100	P-70,756	2.60			
1.37"	100	P-70,757	2.75			
1.43"	100	P-70,758	3.00			
1.50"	100	P-70,759	3.25	100	P-70,517	3.25
1.56"	100	P-70,760	3.35			
1.68"	100	P-70,761	3.50			
1.87"	100	P-70,762	3.75			
2.00"	50	P-70,763	3.00	50	P-70,518	3.00
2.31"	50	P-70,764	3.15			
2.37"	50	P-70,765	3.25			
2.50"	25	P-70,766	2.50	25	P-70,519	2.50
2.87"	25	P-70,767	3.00			
3.00"	25	P-70,768	3.25	25	P-70,520	3.25
3.87"	10	P-70,769	3.00			
4.00"				10	P-70,521	3.00
5.00"				5	P-70,522	3.00
6.00"				3	P-70,523	3.25
Assorted Polystyrene Balls (100).				No. P-70,770 \$6.00 Ppd.		
Assorted Styrofoam Balls (33).				No. P-70,524 4.00 Ppd.		

POPULAR RUBBER BALL KIT FOR OPEN MOLECULAR MODELS

Many award-winning science projects have featured these open-type models of molecular or crystalline structures. Here is a kit with 50 sponge rubber balls 1" in diameter and 50 wooden rods ¼"x6". You can dip-paint the balls in the colors you want, cut the rods to any appropriate length, and point them in the sharpener included. Directions and suggestions are supplied. **No. 30,413 \$2.50 Ppd.**

Rubber Balls only.	Package of 24 (2").	No. P-70,438	2.40 Ppd.
	Package of 12 (3").	No. P-70,439	3.00 Ppd.
	Package of 100 (1").	No. P-60,199	3.50 Ppd.
Wooden Rods only.	Package of 200.	No. P-60,198	1.00 Ppd.



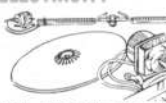
THERMOCOUPLE

Converts heat directly into electricity. 14-gauge, chromel-alumel wire. Hot end protected by six 1" ceramic double bore insulators. Measures 17" overall. Leads are insulated and color coded. Can be used with our pyrometer No. 70,408 or any good millivoltmeter for accurate temperature measurements from 0° to 2400°. **No. 40,478 \$3.75 Postpaid**



CONVERT HEAT DIRECTLY TO ELECTRICITY

Use blow torch, gas jet, or sun to convert heat into electricity. Includes twenty, 14 gauge, 6"-long chromel-alumel thermocouples; washer; bolt and nut for making reflector; materials for building a thermopile; and, 1.5-3 volt, DC motor to run on the electricity generated. Full directions. **No. 70,436 \$15.00 Ppd.**



SEE SOLAR FURNACE AND OTHER SOLAR ENERGY ITEMS LISTED ON PAGES 30, 31



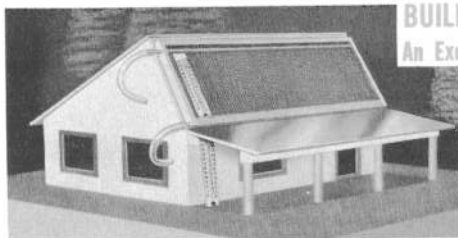
PRECISION PYROMETER

This precision built pyrometer is calibrated for use with chromel-alumel thermocouples such as our No. 40,478 at left. Conversion charts included for use with all other base-metal thermocouples. Also serves as precision millivoltmeter. Has zeroing adjustment. 4.58" x 4". Three separate scales read 32° to 2500° F., 0° to 1370° C, 0 to 55 millivolts. Not easily affected by thermocouple length, but sensitive enough for smallest temperature deflection. **No. 70,408 \$26.00 Ppd.**

EXPERIMENT KIT WITH 8 THERMOCOUPLES

Kit compares the relative characteristics of four different thermocouples. 8 thermocouples include: 2 each of chromel-alumel; chromel-constantan; iron-constantan and copper constantan. Each is 10" long and has a welded hot junction, 1½" porcelain double-bore insulator. Colored insulation on leads indicates polarity. Instructions and millivolts-to-Fahrenheit conversion chart for each. Can be used with millivoltmeter. Each tagged to indicate I.S.A. type. **No. 70,417 \$10.00 Ppd.**

SOLAR ENERGY



Mr. Thomason has successfully designed and built 4 solar heated homes. The principles involve (1) collection of solar energy (heat) in water flowing down patented heat collector on roof (2) storage of hot water in large capacity tank in bed of stones (patented) (3) transmission of heat from water in storage tank to stone bed (4) circulation of air through warm stones provides heat for house. The model demonstrates principles used in the full size units.

BUILD A WORKING MODEL SOLAR HOUSE An Exciting Educational and Science Fair Project

Kit for Working Model, Solar-Heated House, approx. 19" long x 16" wide x 15" high. Can be used outdoors or indoors (if positioned to receive sufficient sunlight). Includes metal reflector roof; parts for heat collecting roof; galvanized hot water storage tank with pipe connections; electric water pump (impulse type); necessary plastic tubing and copper distribution pipe. Also extra plastic sheet for windows and see through areas, screen for heat collecting bin, fan, motor, stepdown transformer and 5 thermometers. You need supply only lumber, small stones, insulation materials, etc. Drawings and construction details contained in Thomason's book, "Solar House Models." Purchase of kit carries implied license from Mr. Thomason to build model using his patents.

No. 70,705 \$24.50 Ppd.

"Solar House Models" only. Harry E. Thomason's book. Covers construction of 5 solar homes. Library of Congress catalog card no. 54-25084. 32 pages (8 1/2" x 11").

No. 9069 \$1.00 Ppd.

Harness the Incredible Heat of the Sun for Experimenting... MAKE A 2,000° SOLAR FURNACE

An ideal project for your next Science Fair.

Think of it, your friends will be amazed that you can harness the incredible heat of the sun for experimenting or for such projects as the following.

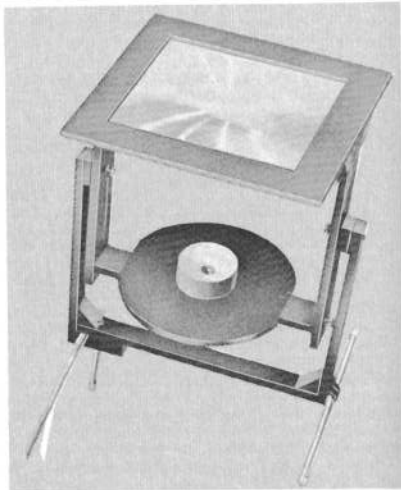
- With the solar furnace, you can use the sun for soldering and brazing.
 - Temper small flat springs
 - Fire enamel on jewelry
 - Make a barbecue grill for cooking hot dogs, hamburgers.
- Focus the noonday Sun on a newspaper and it will burst into flame in half a minute. For only a few dollars you can build a simple, easy-to-make Solar Furnace from this Edmund Fresnel Lens and some scrap parts. It will develop temperatures of 2000° within the area of the focus spot. See the complete description of Fresnel lenses on page 93.

This particular Fresnel lens is 11 1/4" square with a focal length of 19". It is 1/4" thick and has an effective speed of about f/1.9. Only the lens is furnished, not the wood and other parts for the furnace. Included is our 14-page instruction booklet on solar energy and solar furnaces. Lens and booklet described above.

No. 70,533 \$6.00 Postpaid

Solar Energy and Solar Furnaces instruction and idea booklet only.

No. 9053 40c Ppd.



Spins continuously at 3,000 RPM from only heat of sun or light bulb... CROOKE'S RADIOMETER

Set it by your window. Powered by the heat of bright sunlight alone this fascinating solar rotor spins at the fantastic rate of 3,000 revolutions per minute. Operates under ordinary light bulbs... even under the invisible infrared radiation such as that emitted by a glowing cigarette. Requires no fuel, no lubrication, no repairs. Everyone loves to watch it, to learn about this power source so vital and promising to man's future, this almost unexpended power source of solar energy. **This is a new first-surface silvered model.** Silvering on one half makes it an interesting conversation piece for home or office. Gives you a hemispherical mirror. Turn radiometer until mirror faces you—at a glance you see a panoramic view of everything going on around and behind you. Clear and sharp. Attractive desk piece 5 1/2" high x 3" in diam. Partial vacuum in glass globe where 4 vanes spin on a low-friction, needle point bearing.

No. 60,529 \$3.25 Postpaid

As above, but without hemispherical mirror.

No. 60,082 \$2.00 Postpaid



AMAZE YOUR FRIENDS WITH THIS SOLAR CIGARETTE LIGHTER

Requires no fuel whatsoever... just point it at the sun for a quick "light." Light your cigarette in seconds with the heat of the sun. No fuel... no matches... no flame to burn out. Just point your Solar Lighter at the sun for three or four seconds to get cigarette well lit. No need to puff.

Use anywhere outdoors or through sunny windows. Excellent for outdoorsmen... fishermen, hunters, campers. Bright-plated lighter is oval shaped, 3" x 4" and fits easily into pocket, tackle box, etc.

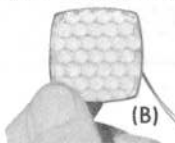
No. 40,307 Only 98c Postpaid

EXPERIMENT WITH HARNESSING SUNSHINE

One of the most interesting areas of scientific experiment is the creation of sun-generated electricity to replace other waning power sources. The Tiroos satellite is sunpowered by panels of solar cells. As it and other man-made satellites are launched into space, they bring nearer the era of sunpowered electricity.



(A)



(B)

SELENIUM AND SILICON SOLAR CELLS (PHOTOCELLS)

These solid-state devices produce electricity directly from light. The selenium cell has a spectral response that closely approximates that of the human eye. For this reason it is the type most often used in photometric applications such as light meters, densitometers, etc.

The silicon cell has greater response in the short, infrared region and hence is more efficient under incandescent illumination. Both types of cells can be used for powering small transistor radios, building burglar alarms, solar-powered battery chargers, headlight-activated garage doors, automatic light controls, automatic stop for tape recorders, sun-tracking devices for solar furnaces, slave flash units, camera shutter checking devices, light beam communications, etc. Many other applications are described in booklet No. 9230 at right.

Item	Size	Output in IR Full Sunlight		Price, No. Ppd.
		No.*	Volts Ma	
(A) Selenium with color-coded leads attached	1 1/4" x 1 3/8" x 1/2"	.2	4 to 5	30,411 \$1.50
		.5	6	
(B) Silicon in molded plastic case, coded leads	1 1/8" x 1 1/8" x 3/4"	.3	10 to 16	60,216 2.25
		.45	16	
(B) As No. 60,216, but with 2 elements in series	1 1/8" x 1 1/8" x 3/4"	.6	10 to 16	60,396 3.95
		.85	16	
(B) As No. 60,216, but high efficiency type cell	1 1/8" x 1 1/8" x 3/4"	.4	40 to 50	60,397 3.95
		.5	50	
(B) As No. 60,216, but high efficiency type cell	1 1/8" x 1 1/8" x 3/4"	.6	18 to 25	60,398 4.95
		.025	25	

*International Rectifier Number

Descriptive 24-page booklet included with all but No. 30,411. Describes how they work, and gives you over 12 fully-diagrammed experiments that you can perform. Tells you just how to measure solar power.

"Solar Cell & Photocell Experimenter's Guide"

By Stu Hoberman. Less theoretical than our No. 9230, with many easy-to-build, low-cost projects ranging from light switches, photo-relay drivers and light meters to photologic circuits, remote controls, color comparators, etc. Paperback, 128 pages (5 1/2" x 8 1/2"). Over 100 illustrations.

No. 9368 \$2.95 Ppd.

Build Automatic Light Control or Light Level Comparator . . . See Our Photoconductor Kit, Page 53.



60", A. A-TYPE GOVT. SEARCHLIGHTS AND MECHANICAL LAMPS . . . WRITE FOR BULLETIN 44 FOR MORE DETAILED INFORMATION

For solar energy furnace, publicity and advertising, research and tracking. Government cost \$25,000. Searchlight and mirror have been carefully inspected and are in excellent condition. Shipped F.O.B. from N. Y.

No. 85,033 \$1,495.00

No. 19,073 \$400.00

Available again—Mechanical Lamps.

60" size. Shpg. wt. 65 lbs.

No. 19,083 \$300.00 F.O.B. New York

24" size. Shpg. wt. 45 lbs.

No. 19,084 \$300.00 F.O.B. New York

Replacement parts available for 60" size

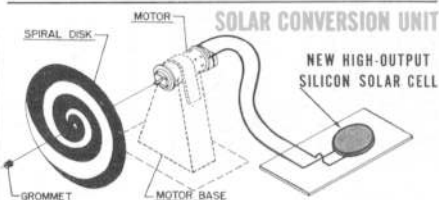
SOLAR CELL AND PHOTOCELL HANDBOOK



136 page clearly written technical manual containing projects, demonstrations of selenium and silicon cells including chapters on photovoltaic theory, performance, infrared and ultraviolet applications. Paper-bound, 6" x 9". **No. 9230 \$2.00 Ppd.**

SOLAR CELL EXPERIMENT SET

Cells No. 60,216, 30,411, 60,222 (Pg. 28, 31) plus the Solar Cell Handbook above. **No. 60,291 \$7.95 Ppd.**



Improved project kit shows how sun's radiant energy can be converted to electricity to run a small motor. Relatively high conversion efficiency . . . runs small model boats and (with suitable gearing) cars, trucks, etc. Works well even under strong incandescent illumination. Includes new, high-output silicon solar cell (No. 30,538), efficient ball bearing motor, spiral cardboard disc, grommet, instructions (no motor support or cell mount).

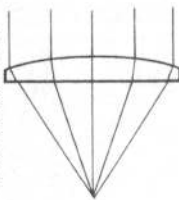
No. 60,505 \$11.45 Ppd.

Motor only (see pg. 54). **No. 40,902 \$3.95 Ppd.**

NEW BURNING GLASS LENS

This large 2 1/2" square x 1/4" thick, plano-convex lens makes an excellent burning glass. Focal length 5". Smooth rounded edges make it durable. Will burn holes in paper and light cigarettes. Excellent for campers, experimenters. Makes nice paper weight. Can be heated in oven and dipped in ice water to fracture it internally.

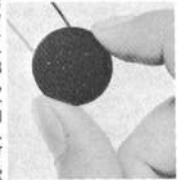
No. 40,966 \$1.00 Ppd.



HIGH-OUTPUT SILICON SOLAR CELL

"ONE OF THE FINEST I'VE EVER SEEN," says our Engr.

Small yet extremely powerful this cell permits applications formerly impossible . . . use in solar powered boats, toy cars, etc. Compared with Silicon Cell No. 60,398 its output is 4 times greater, yet it costs only \$2.50 more. Exposed to bright sunlight this cell delivers more than 1/10 amp. current. One alone operates our ball bearing motor (No. 40,902, Pg. 54) even under incandescent illumination. Open circuit voltage, 0.5V; short circuit current, 100ma; output in excess of 20 mw. Color coded leads. Cell is 1/4" in diam. and less than 1/4" thick.



No. 30,538 \$7.50 Ppd.



IDEAS

for your Science Project

FREE

Write for our **FREE Bulletin Number 47... YOUR SCIENCE PROJECT.** Find out what makes a good project, how to think creatively and scientifically. Bulletin lists sources for ideas and information and guides you in recording, reporting and exhibiting your project.

ASTRONOMY

Build your own telescope from scratch (see page 128) or buy a completed one (121-126). Use it for star and moon studies, comet seeking, observing comets and sun spots, etc.

ASTRO-PHOTOGRAPHY

Astro-photography projects are often award winners. Use your camera and telescope with our camera holders, camera-telescope adapters (141) and clock drive. Edmund improved clock drive (139) has motion control lever that keeps camera on target.

BIOLOGY, BOTANY, ZOOLOGY

Do an ant study project using our giant ant nests complete with ants (27). Studies of bird population, habitat, courtship, etc. are easy when you use our binoculars (17-19) and spotting scopes (115).

Low-cost, high-quality microscopes (62-68) are a must in microbiology and anatomy studies. Dissecting kits, nature study kit (66) anatomy study cards and wall charts (44) will help you get the most out of your project. Build your project around our molecular models with pre-grouped atom clusters (29, 41).

ELECTRICITY

Ben Franklin would have been overjoyed with our hard-to-find electrical items. Rechargeable nickel-cadmium batteries (13, 52) are perfect for supplying power for your displays, demonstrating electrical phenomena, etc. Convert heat to electricity with thermocouples (29). Also see our battery holder with rheostat (53), electrostatic generators, transformers, etc.

GEOLOGY AND PALEONTOLOGY

Study fluorescence in minerals with our ultraviolet light sources (99, 100). Do a project on soil composition with one of our soil testing kits (27) or geological, sand-measuring magnifier (76).

LIGHT, BLACK LIGHT, INFRARED, POLARIZED

Use fiber optics (12, 87, 94) to transmit light to inaccessible places. There are hundreds of project possibilities using infrared and "black light". Black light materials will increase your exhibit's appeal. Use our illumination meter (144) to do a study of the effects of varying light intensity on plant growth, work and study efficiency, etc. Demonstrate how polarizing material (2, 86) causes light to vibrate in only one direction. Photo motion kit (114) uses polarized light to create motion in transparencies, signs and displays.

MAGNETISM

Demonstrate magnetic flux or determine magnetic fields with any of our various magnets (14-16), magnet kits (15) and iron filings (15).

MATHEMATICS

More and more math projects are winning awards. See our listings of math aids, gadgets, games and books (36-39). Note slide rules (38), geometric models (40, 41) and our analog and digital computers (5, 37).

METEOROLOGY

Learn how to forecast the weather. You can do a most impressive project by recording daily variations of temperature, wind, discomfort index, precipitation, etc. See our weather instruments (56) and weather balloons (147).

MICROSCOPY, PHOTOMICROGRAPHY

Good photomicrographs are often the only way to illustrate your project. Don't handicap it by using a microscope with poor lenses. See our large selection of microscopes (62-68) that are low in price but offer you guaranteed optical quality.

Our instruction sheet, "Photomicrography with Pen Microscope" (110) shows how to use inexpensive microscopes for exciting photos of minute objects.

OPTICS

For the world's largest collection of optical bargains see almost any page in this catalog. Don't overlook lenses, (79-85), prisms (90-92), fiber optics (12, 87, 94), optical bench (77) and polarizing materials (2, 86).

SOLAR ENERGY

Build solar furnace or solar grille. See our Solar Energy Kit and Solar House Kit (30), first surface mirrors, Silicon Solar Cells, photocells, and concave mirrors. Harness sun for electricity (31).

SPECTROSCOPY

There are unlimited possibilities, from simple demonstrations of spectra as produced by prisms and diffraction gratings to advanced studies. We have spectroscopes (102), too.

SURVEYING AND CARTOGRAPHY

Do a graphic exhibit based on hand sighting level, lensatic-compass and rangefinder.

MISCELLANEOUS

Our water pumps (8, 54) are the ideal start for a project on blood circulation, irrigation, etc. Medical items such as a stethoscope or hemostat offer possibilities.

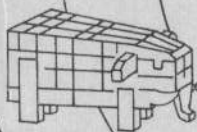
Papier maché, artist brushes (24), needle files (50), are some tools you may need. Male manikin (24) is ideal for a human biology project. The battery holders on page (53) offer a splendid means of adding motion to a project. Photo Motion (114) adds motion to transparencies and large slides.

SCIENCE PROJECTS HANDBOOK

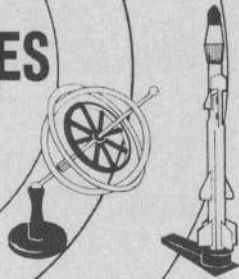
Here are more than 1,000 ideas for science projects and experiments, plus valuable tips from Science Fair winners. This 254 page book is a must for elementary or high school scientists.

No. 9317 50¢ Ppd.

SCIENCE TOYS AND GAMES



- GYROSCOPE
- WOODEN PUZZLES
- ROCKETS
- HUMAN MODELS



TELESCOPE-KALEIDOSCOPE ... GIVES KALEIDOSCOPIC, RAINBOW VIEW TO EVERYTHING IN THE WORLD AROUND YOU

Blend your surroundings into an abstract, artistic pattern. This new version of the old, old kaleidoscope does not use bits of colored glass as the old models did. Instead it picks up a view of your surroundings and transforms it into the unique, fascinating patterns of the kaleidoscope. When turned on a moving object, it produces a flashing, darting pattern.

How does it work? The lens projects the light rays down the tube; there mirrors reflect them back and forth. Each reflection forms one section of the pattern. Makes a fascinating teaching or learning device for exploring theories of optics, light and color. 9" tube of multi-colored paperboard, 2" in diameter.

No. 50,349 \$4.00 Ppd.

NEW KIT! HAVE FUN WITH PREHISTORIC DINOSAURS & MONSTERS



Build a dinosaur land... loads of fun and educational, takes you back through 200,000,000 years of earth history recorded from bones and fossils. Dinosaurs in kit include the giant Brontosaurus, 70-ft. in length and weighing in at 60,000 pounds; and Tyrannosaurus Rex, fierce 19-ft. king of the meat eaters; plus 10 others. Mammals include Woolly Mammoth of the ice age; the ferocious Smilodon or "Saber-Toothed Tiger"; etc. A total of 24 realistic plastic figures 2" to 6" long identified on body. Also dinosaur bone (approx. 1") in plastic specimen box; 8 1/2" x 5" x 1 3/4" box of lichen (assorted colors) for making life-like trees and shrubs; 48-pg. book on dinosaurs and complete instructions for building a dinosaur land with streams, trees and mountain.

No. 70,817 \$5.00 Postpaid

PREHISTORIC MODELS ... 52 PIECE KIT



These plastic (two) assembly kits are scaled from American Museum restorations. Full 13" model of Brontosaurus, the 35-ton giant dinosaur. (52 pieces) 10" model of the Mastodon, the 15-foot ancestor of the elephant which roamed America some ten-million years ago. (43 pieces.)

No. 70,221 \$2.00 Ppd.

WFF'N PROOF

21 games of modern logic... unadulterated enjoyment for 6-yr.-olds to logicians.



Hailed as significant to the teaching of logic as the launching of the first satellite was to the space race. Developed by Yale professor who thinks learning should be fun, this 21-game kit starts with games that can be mastered by 6-year olds and ends with subtle games to challenge intelligent adults. Gives practice in 'abstract thinking and mathematical logic... complex as chess, exciting as poker. Book-like case (8 1/2"x5 3/4") stores logic cubes, playing mats, timer and 224-page instruction manual.

No. 60,525 \$6.00 Postpaid

WFF. 2-game kit of modern logic designed especially for beginners.

No. 40,808 \$1.25 Ppd.

WFF'N PROOF Equations. 5-game kit of creative math for grades 1-12.

No. 60,526 \$3.00 Ppd.

TWO NEW GAMES FOR THINKERS, FROM CREATORS OF WFF'N PROOF

NEVER BE FOOLED BY PROPAGANDA AGAIN

Learn to think clearly, spot techniques used by professionals to mold public opinion... technical jargon, rationalization, faulty analogy, quotations out of context and over fifty others. This game for thinkers was developed by Lorne Green (of Bonanza fame) and Robert Allen (Academic Games Director for Nova Schools).

The Propaganda Game is for 1-4 players of junior-high-school age and up. It teaches players to analyze writing, political speeches, advertisements, editorials, etc.; and to judge their emotional impact on readers. Are you a clear thinker or a "deluder's delight"? Maybe you have "Mother-in-law Mentality". Play The Propaganda Game and find out while having lots of fun. Game includes: 77-page text which explains rules, defines technique, gives examples; "Clear Thinking Chart"; 4 prediction dials; 40 example cards to help develop your ability; instructions for "Expert" play and 4 different colored markers.

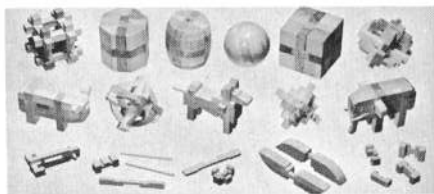
No. 60,663 \$5.00 Ppd.

CONFIGURATIONS FOR CONCENTRATION

Have stimulating fun with this series of intriguing mathematical and geometrical puzzles that challenge your imagination and reasoning powers. The Configurations Game Kit contains number puzzles and geometrical patterns and designs that are to be solved by one person of junior high-school age or up. Math students particularly enjoy solving them and using their own ingenuity to create other puzzles and designs. Professor H. L. Dorwalt's book, "The Geometry of Incidence", provides the basis for this intellect-challenging game. A gift that gives many days of enjoyment.

No. 60,664 \$4.00 Ppd.

SCIENCE TOYS & GAMES



12 WOODEN PUZZLES... BRAIN TEASERS

Here is a fascinating assortment of wood puzzles that will provide hours and hours of pleasure. Included are 12 different puzzles... animals and geometric forms to take apart and reassemble. Special design gives the whole family a chance to test their skill, patience, and most important of all, their ability to think and reason while having fun. Excellent amusement for recuperating youngsters.

No. 70,205 \$3.50 Postpaid



**CAR OF THE FUTURE
HERE NOW
\$2.98**

One of the most impressive science toys we have seen. Rides a fraction of an inch over any surface, including water. Graphically demonstrates the same principles of low frictionless motion that apply to Ford's and Curtiss-Wright's new, wheelless aircars. Sturdy red and yellow plastic, 8" wide, 9" deep, 2" high, with 4" propeller. Operates on 2 flashlight batteries (not included). 48" control line, battery case.

No. 70,307 \$2.98 Ppd.

LOW FRICTION AIR PUCK

Floats around on a flat surface on a cushion of air. Touch it just slightly and it will slide without friction across the table. Operates on the same principle as Ford's airglide cars.

For classroom study of friction. Special balloon provides the air. Base is made of strong, flat plastic, 5" in diameter. Extra balloon is included.

No. 50,228 \$2.00 Ppd.



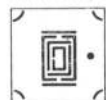
THE MOONBALL... RELIEF REPRODUCTION

Approved by leading planetariums and museums, this 6" diam. rubber replica is silver finished. Gives craters and markings in relief. Facts such as surface, temperature, distance from earth, deepest crater, etc., are marked in relief. Complete map included. Fine for children's ball.



**No. 70,129
\$2.50 Ppd.**

AMAZING, EDUCATIONAL MERCURY PUZZLE



This little puzzle is real fun. You can try trick after trick, putting all the mercury in the center, etc., and as you work these puzzles you'll learn about the properties of mercury. Sealed-in mercury cannot escape.

No. 40,384 69c Ppd.

Pkg. of 10 No. P-70,583 \$6.20 Ppd.

DELUXE SATURN GYROSCOPE TOP



**DEFIES
THE LAWS
OF GRAVITY**



Spins and balances at fantastic angles... on the tip of a pencil, hanging from a loose string on your finger... even on the edge of a glass. It won't fall! Place it on its pedestal, at any angle... that's where it stays.

It's the most fascinating toy ever built. You have to see it to believe it. Minute precision is the secret of the Saturn Gyroscope. The "fluid sand" weighted rotor spins on tiny micro-bearings so small that a thimble holds over 400 of them. It performs longer and runs quieter, at the unbelievable speed of 10,000 RPM. Quieter, smoother, more shock resistant. Made of super-impact Dow Styron H75... defies breakage.

No. 60,052 Price \$1.74 Ppd.

LOW COST GYROSCOPE

Similar to above. Use to demonstrate principles of gyro dynamics. Has special "no string" starter but can be string wound. Includes special Edmund booklet on gyro experiments.

No. 60,232 75c Ppd.

BASICS OF GYROSCOPES... Machover

Comprehensive. Gyros, precession, gyro-compasses, etc. Paperback, 101 (6" x 9") pages.

No. 9316 \$3.30 Ppd.

APOLLO STAGING ROCKETS WITH EXTRA ANTI-MISSILE ROCKET

We learned that single stage models were being used in a government sponsored science teaching system to demonstrate the principles of jet rockets.

Here's a new, two-stage model. It's simple to operate. Just partly fill with water and operate air pump (included) to fill balance of space. Press release and up, up, up they go. The first stage goes up 200 feet; then the second stage rocket is released and blasts off to climb another 100 ft. higher. It's fascinating fun. Made of Butyrate plastic, the rockets are extremely durable.

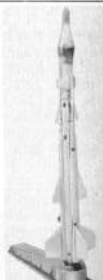
Apollo Staging Rocket Set. Consists of 1st and 2nd-stage rocket. Plus 12" anti-missile rocket, fuel funnel and piston stem and improved air injection pump.

No. 70,157 \$3.00 Postpaid

NEW! 1 1/4" ROCKET WITH CHUTE & CAPSULE SOARS TO 600 FEET!



Soars to fabulous height, then rocket and capsule disengage and float to earth, each on its own parachute. Launch again, but this time delay the parachute opening; there are eleven time delays to choose from. Set your controls for a slanting launch and continue your experiments. Safe to use, no chemicals or explosives. Two-handed, double sling (rubber) launches the rocket from its pad. All you do is set the controls, stretch and set the sling and release with your foot when ready. Made of high impact plastic. Imported from Italy. Complete instructions included.



No. 70,845 \$3.50 Postpaid



THIS BIRD HAS A THERMAL- ENERGY THIRST

What an everlasting thirst. This gay bird runs on thermal energy generated by an occasional feeding of water. Perfect for demonstrating the conversion of heat energy into motion through evaporation and condensation. (Contains a safe liquid.) 6" high. Full explanation included.

No. 60,264 \$1.00 Ppd.

LEARN ENGINE "KNOW-HOW" WITH THE VISIBLE V-8

If you are an interested teen-ager or pre-teen, a serious student of automotive mechanics, science student interested in combustion engines, or just a driver who wonders "what makes it tick," this excellent model is the answer. 1/4" scale, easy to assemble and use. Molded in four colors.



First you will have the thrill of building this engine from over 350 parts. Learn about motors as you do it. This same motor is used in many auto mechanic courses. Then push the starter and watch it run. It does everything but burn oil. Crankshaft revolves, pistons move, valves open and close in sequence with spark plugs. All functioning parts can be observed. With excellent, easy-to-understand "tech manual."

No. 70,448 \$12.95 Ppd.

HIGH SPEED STEAM PLANT — ELECTRICALLY HEATED



You'll have hours of fascinating fun with this versatile steam plant. Powerful double-acting oscillating engine. 1/2" bore x 3/4" stroke; 3" diam. flywheel has high & low speed pulleys. Drives numerous devices, erector sets, models, miniature generators, etc. Completely safe for youngsters; boiler has safety valve, water gage, throttle valve and whistle. Totally enclosed electrical heating unit. U.L. approved. Horizontal, brass, nickel-plated boiler is 2 1/2" diam. x 6" long. Metal base measures 8 3/4" x 9 1/4". Height, including chimney, 9". Instructions and filling funnel included.

No. 70,822 \$19.00 Ppd.

EDMUND SAMPLER OF OPTICAL BARGAINS

A variety package of our most popular optical items: (1) Prism. To see the spectrum and experiment. (2) Fun With Optics. 32-pg. book. (3) Beginner's Lens Kit. 10 lenses and instructions. (4) Star and Satellite Path Finder. (5) Diffraction Grating. In 35mm mount. (6) Rectangular Magnifier. 1.8X (2 1/2" x 1 3/4"). (7) Two Polarizing Filters. (8) Five Double-Convex Lenses. 14mm x 48mm F. L. to make high-power magnifier.

No. 50,204 \$3.50 Ppd.



PROBABILITY KIT Investigate and demonstrate the laws of probability and chance. This unusual kit includes actual working roulette wheel, slot machine, chuck-a-luck, cardboard cut-outs for making two pairs of giant dice for demonstrations and a package of shot for probability board studies. With detailed instructions & suggestions. **No. 70,335 \$5.50 Ppd.**



MAGNETIC BALLS JUMP, WIGGLE, DEFY GRAVITY They orbit, they roll, they cling together. Play loony marbles, where the object is to avoid collision . . . dozens of tricks. These perfectly round, black balls of hard rubber-like material roll in the craziest directions. They're magnetized. Four sizes on card with instructions. **No. 60,508 \$1.00 Ppd.**

MAGNETIC DOGGIE AND THE SPINNING BALL

Just push this frisky plastic puppy towards the ball and watch it roll away, spinning all the while. Performs on any non-ferrous, flat surface. Two 2 3/4" high dogs and 2 balls.



No. P-60,527 \$1.00 Ppd.

EDMUND'S POPULAR SCIENCE FUN CHEST

Many hours of fun and learning for only **\$5.50 Ppd.**

Eleven of our most popular science toys and curiosities to amuse anyone, young or old. A value of over \$7.25 if purchased separately. **YOU GET:**

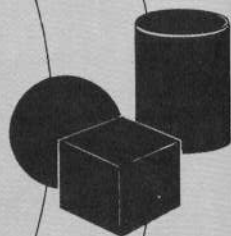


- 1) Albert The Bobbing Bird. Bobs continuously (by thermal energy) with a glass of water in front of him.
- 2) Create Moiré Patterns, five-piece Moiré Color Set.
- 3) Fascinating Sealed Puzzle with real mercury inside.
- 4) Diffraction Grating Rainbow Viewer. Mounted transmission and reflection-type gratings, each with 13,400 grooves per inch.
- 5) New motion saving PIX-UP Ring (with EDMUND-TAK).
- 6) Five flat Ceramic Magnets in plastic storage box.
- 7) Burning Glass Lens, 3" square in 4" x 4" Zip-Lip Bag.
- 8) Magnetic Doggie, ball spins as he approaches it.
- 9) Static Electricity Generator. Safe, fun with friends.
- 10) Roy G. Biv Membership Card. Memorize colors of spectrum.
- 11) Edmund's ever-popular "Astronomy and You" Booklet. Instructions incl. Storage box.

No. 70,787 \$5.50 Ppd.

MATHEMATICS

CRYSTAL MODELS
GEOMETRIC SOLIDS
RUBBER STAMPS
ABACUS
SLIDE RULES



MATHEMATICS... ITS IMPORTANCE TO YOU AND YOUR CHILDREN

Math is important to all areas of science and business. Right now, there is a demand for over 50,000 mathematicians to work with electronic computers alone. Mathematics is the prime work tool of chemistry, engineering, astronautics, many of the sciences as well as general business. Without math-know-how, your children and you have little chance of great success in modern industry and commerce.

As math is going to be so important to your children, start them playing with math items early to promote development of favorable attitudes, improve motivation and bring a variety of experiences for math learning. Remember that the usual chalk-and-blackboard, paper-and-pencil methods of instructing the child are entirely inadequate. The manipulation of objects is essential for number concept development.



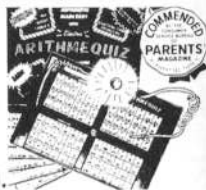
NEW, DIRECT READING BALL ABACI AID LEARNING

Perfect for calculations and teaching or learning math. Adds, subtracts, multiplies and divides up to 99,999. A handy and unique visual aid. Use in classroom demonstrations in combination with students' models or by itself. Not an old fashioned disc type but a modern direct reading ball abacus. Read directly by associating the number of balls with the numerals. Demonstrates the base-ten number system. Two sections with 5 columns of colored, plastic balls; red, yellow, blue, black and white. High-impact plastic case (2" thick x 17" wide x 27" long) can be hung on wall or blackboard, propped on desk, etc. Very complete instruction book included.

No. 80,098 \$21.50 Ppd.

FASCINATING ELECTRIC MATH QUIZ GAME

"Daddy, it lit, I'm right." Those proud words will show your child's real interest as he solves problems in subtraction, addition, division, multiplication. Problems on six large cards. Light glows when child picks right answer. Grades 2-5.



No. 70,258 \$2.98 Ppd.

STUDENT MODEL

Same design as above, but on smaller scale. Lightweight, $\frac{5}{8}$ " x 5" x 8" plastic case weighs only 10 oz. As easy to carry as a small book. Instruction booklet incl. Used alone or with teacher's model as listed above.

No. 60,645 \$2.50 Ppd



JAPANESE SOROBAN ABACI

These are the same Japanese abaci widely used in actual business in the Far East. Using them a proficient abacus operator can compete with modern office machines. Handy pocket sizes. Complete instructions included.

Nine-Line Abacus. **No. 30,331 \$1.00 Ppd.**

Thirteen-Line Abacus. **No. 30,332 \$1.50 Ppd.**

Twenty-One-Line Abacus. **No. 50,293 \$2.75 Ppd.**

"THE JAPANESE ABACUS EXPLAINED"—Y. Yoshino

Paperbound, 240 pages ($5\frac{1}{2}$ " x $8\frac{1}{2}$ ") with over 300 diagrams.

No. 9370 \$1.35 Ppd.

"A PARENT'S GUIDE TO THE NEW MATHEMATICS"

By Evelyn Sharp. That revolutionary "New Math" book the whole country is talking about. A book that should be read by every parent with school age children. About sets, number systems, the number line, modular arithmetic, matrix algebra, non-metric geometry, inequalities and probability. Includes problems with answers! Paperbound, 187 pages ($4\frac{1}{2}$ " x 7").

No. 9369 Only 75c Ppd.

ADD-A-COUNT SCALE

Hours of fun for ages 4 to 7. Plastic balance scale and 14 plastic numbers from 1 to 9. Registers correctly only when numbers on one arm equal those on other.

No. 60,098 \$1.50 Ppd.



RULER TEACHES FRACTIONS EASILY



Here is an ingenious, manipulative arithmetic device; ideal for grades 4 through 8.

Attached to the standard ruler are hinged parts on which are printed fractional equivalents, decimals and percents. These can be manipulated to form many combinations. Rule is 12" long by $\frac{1}{8}$ " wide by $\frac{3}{16}$ " thick. Made of white, washable polystyrene plastic.

No. 60,091 \$1.25 Ppd.



NEW BALL POINT PEN WRITES IN 12 COLORS!

A most useful item for students. Use colors to draw and distinguish different lines. Ideal for bar charts, graphs, geometric figures and other mathematical applications. This "automated ball point" is a great time saver.

Simply pull back on spring-loaded, transparent plastic selector top and then dial your choice of pen points—red, dark blue, black, light brown, yellow, orange, pink, light blue, light green, dark brown, dark green, violet. Plastic body, 6" long x $\frac{1}{8}$ " in diameter.

No. 60,575 \$1.75 Ppd.

One 12-color Refill.

No. 40,901 85c Ppd.

FASCINATING FUN—EDMUND ANALOG COMPUTER KIT



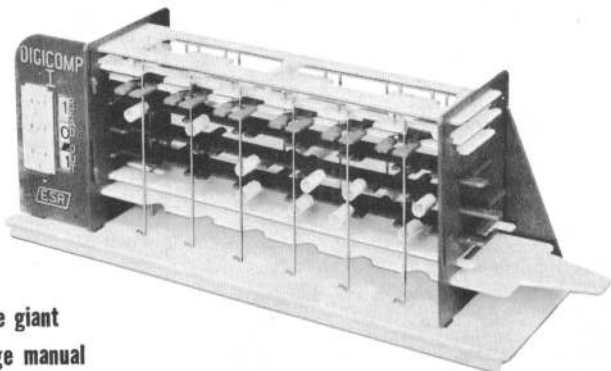
Demonstrates electronic computing
Easy to assemble and operate

For bright students of junior or senior high level, or any one of any age interested in this new science. Demonstrates basic analog principles and can be used for multiplication, division, powers and roots, log operations, circumference and volume, etc. Solves problems of trigonometry, works out physics formulas, performs unit conversions and is useful in magnetism, electricity and geometry. Easily assembled with only screwdriver and pliers. Operates on two flashlight batteries. Three potentiometers and an electric meter are mounted on the diecut cardboard box. Two potentiometers are rotated and set at appropriate numbers. The third is then rotated until dial reads 0. Position of third dial then indicates answer. Computer measures 20" long, 9" wide, 2" deep. Complete instructions included. (No batteries.)

No. 70,341 \$14.95 Ppd.

EVERYONE'S FAVORITE—WORKING MODEL DIGITAL COMPUTER

IDEAL GIFT FOR
THE SCIENCE-MINDED
—YOUNG OR OLD



Solves real problems.

Learn firsthand what makes the giant
computers tick with big 32-page manual

It's fun. This new working model computer is a junior mechanical version of the electronic brains now used in modern business. Developed by two of the nation's foremost authorities in the field, it is capable of adding, subtracting and multiplying. It shifts, complements, carries, memorizes, counts, compares and sequences. With it you can play games, tell fortunes and challenge the imaginations of everyone in the family. Easy to assemble from rigid plastic parts in attractive colors. 12"

long x 3½" wide x 4¾" high. Includes assembly diagrams plus 32-page manual covering operation, computer language (binary system), programming problems and 15 experiments.

No. 70,683 \$5.98 Ppd.

New! "Detailed Programming." How each experiment in manual for above was programmed. 50 pages (7" x 9¾").

No. 9080 \$1.00 Ppd.

See larger and much more versatile Digital Computer described on page 5.

FASCINATING DR. NIM -- DIGITAL COMPUTER VERSION OF PICK-UP-STICKS

*Whether you're 5 or 60, you'll enjoy trying
 to outwit this new binary computer toy*



A delight for youngsters, challenging for adults and teaches computer fundamentals. In fact, you can count you can play.

Each play you release a marble that rolls down a plastic game board through a series of authentic flip-flop channels. How you set the flip-flop to begin, and the path each marble takes determines the path of succeeding marbles—all predictable. You may take 1, 2 or 3. But think first! Then Dr. Nim automatically selects 1, 2 or 3 marbles in his turn . . . and whoever takes the last marble loses. Dozens of other variations.

Durable red and white plastic, 11¾" x 12½" x 1½". Instruction booklet includes detailed discussion of Dr. Nim as a computer plus material on the philosophy of computers.

No. 70,816 \$3.50 Postpaid

BRAIN TEASING FLIP-FLOP TOY FOR 2-YR. OLD OR PH.D.

Computer type—you can actually work out flow chart for programming it

Stimulating and thoroughly amusing, this toy take-off on a digital computer has 8 binary memory cells or "flip-flops" that perform logical operations. Simply tilt to program; then every time you drop a marble into one of the three holes on top, a new, predictable, 2-color pattern appears on the screen.

There are 256 patterns in all, and the real fun begins when you try to put each pattern on the screen in the minimum number of moves (drops of a marble). Heavy plastic in 4 colors. 5" x 6" x 1½". Instructions include 40 pattern problems (216 more can be calculated) and theory. **No. 70,813 \$2.50 Ppd.**

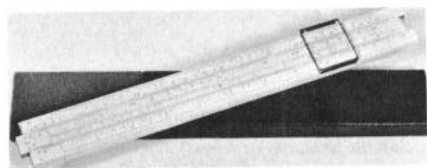


SLIDE RULES

"HOW TO USE A SLIDE RULE" by Heinke

Professor Heinke clearly demonstrates how to use the slide rule quickly and accurately. Full explanations and charts.

No. 9339 \$2.25 Ppd.



ECONOMY MODEL—EDMUND TESTED, APPROVED

Ideal gift for any science or math minded boy or girl. This 10" rule is made of rugged, non-warping bamboo, plastic coated and has a glass cursor. It contains scales K, A, B, C, D, L on front; S, S & T and T on reverse side . . . plus decimal equivalents and other important references. Both top and bottom of rule have inch scales. Compare for yourself against higher priced American or imported slide rules. Satisfaction guaranteed.

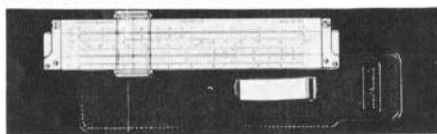
No. 30,412 \$6.00 Ppd.

10" STUDENT MANNHEIM TYPE SLIDE RULE

Specially designed for high school use. Precision construction of $\frac{1}{8}$ " thick white plastic. With scales S, K, A, B, C, D, L and T engraved on face. Plain back. Complete with lucite cursor, leatherette sheath and instruction book.

No. 30,379 \$1.95 Postpaid

5" REDI-RULE POCKET SLIDE RULE



A professional type slide rule in handy pocket size. Can't be matched for true portability. Precision made by Dietzgen. Engraved in solid white plastic with stainless steel, adjustable end plates. Front scales: DF, CF, C, F, C, D and L. Rear: K, AB, T, ST, S, D and DI. With leather case and pocket clip. Instruction manual included.

No. 30,382 \$7.75 Postpaid

10" ALL METAL SLIDE RULE

A truly professional slide rule for engineers and mathematicians, also advanced students. Log decimal trig type. Meets the specifications of the National Defense Education Act. Face scales include LL02, LL03, DF, CF, C, F, C, D, LL3 and LL2. Rear scales include LL01, K, A, B, T, ST, S, D, L, LL1. Calibrations are engraved on white plastic, and facing is permanently bonded to rigid magnesium core. Trig and log numbers are printed in red for easy reading. Attractive leather sheath and complete instructions.

No. 30,378 \$13.95 Postpaid

10" SLIDE RULE RUNS IN TEFLON GROOVES

A quality log decimal trig slide rule for all types of calculations. Precision made by Dietzgen. Scales LL02, LL03, DF, CF, C, F, C, D, LL1, LL3, LL2. Reverse scales: LL01, K, A, B, T, 45°, T45°, ST, S, D, D1 and LL1. Calibrations engraved in 2 colors on white plastic. Facing is permanently bonded to hardwood core. Slide runs in Teflon grooves which eliminates all sticking. Heavy leatherette case with clasp, instruction manual, plus conversion tables included.

No. 30,381 \$30.00 Ppd.

SEE SLIDE RULE TIE CLIPS PG. 45

NEW CIRCULAR SLIDE RULE WITH UNIQUE CONVERSION SCALE



Features a scale of over 90 direct conversion fractions that almost entirely eliminates searching in books and tables. Used with C scale (carrying denominator unit) and D scale (carrying numerator), it allows you to introduce the conversion factor into the problem automatically. Remaining standard scales include R, K, D1, S and T. Almost encyclopedic rear face gives over 700 formulas, values and identities covering fields of mechanics, heat, sound, light, electricity, measurement, trigonometry and astronomy—all fully readable! Rugged vinyl construction with all printing protected by clear plastic lamination. $6\frac{1}{2}$ " diam.

No. 60,596 \$4.75 Ppd.

TWO-SIDED CIRCULAR SLIDE RULE

Increased spacing makes it much easier to use than the conventional "slip stick". Solves problems in multiplication, division, addition, subtraction and proportion. Gives all roots and powers. Eight scales: C, C1, addition and subtraction, square root, log-log, binary, fraction and thread scales. Three headline indicators. Black numerals and graduations on light green enameled aluminum . . . a glare free satin finish that prevents eye strain. Highly resistant to wear . . . protected by three coats of transparent lacquer. $4\frac{1}{4}$ " in diam. In simulated leather pouch with instructions.

No. 40,784 \$5.00 Ppd.



15" CIRCULAR RULE

Multiply, divide, proportion; find reciprocal, square, square root, cube, cube root, circumference, area, etc. Also 48 conversions, cm., in., etc. $6\frac{1}{2}$ " diam. plastic-finish cardboard; plastic slide.

No. 40,364 75c Ppd.

No. P-50,360 (Package of 10.) \$6.00 Postpaid

Low-Cost Radian Protractors. Made of heavy card stock. With directions.

No. P-50,265 (Pkg. 25) \$3.75 Ppd.

RULE FOR FRACTIONS

Adds or subtracts. Converts to common denominator. To add $\frac{1}{4}$, $\frac{1}{8}$, just dial numbers. You get $\frac{3}{8}$. For any combination of $\frac{1}{2}$'s, $\frac{1}{4}$'s, $\frac{1}{8}$'s, $\frac{1}{16}$'s, $\frac{1}{32}$'s, $\frac{1}{64}$'s. $4\frac{1}{2}$ " diam. aluminum. With case. Does not multiply or divide.

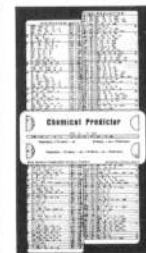
No. 30,361 \$3.50 Ppd.



PREDICT AND ILLUSTRATE OVER 30,000 CHEMICAL REACTIONS

Excellent for teachers and junior and senior high school students. New Chemical Predictor has two charts of equations so arranged that any combination can be instantly selected to furnish the detailed equation for the chemical reaction. Numerical data shows whether a reaction can occur, and if so, the extent and the products of it. Manila-like stock, coated. $5\frac{1}{2}$ " x 11".

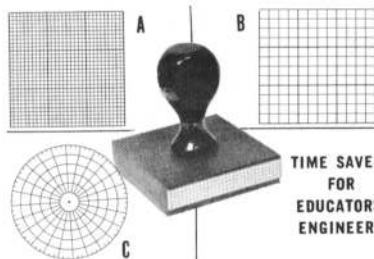
No. 40,752 95c Ppd.



EDMUND GRAPH STAMPS TAKE ALL THE TROUBLE OUT OF GRAPHING

This Edmund development is a real educational-engineering convenience. No longer is it necessary to laboriously draw in graph patterns by hand. No need to cut, staple or scotch tape graphs to test papers, engineering notebooks, reports or correspondence. Teachers from elementary school up find these stamps a great aid.

Electronic design and development engineers use them for plotting curves. Engineers and businessmen, who plot curves in sales, production control and the like, find these low-cost stamps real time savers.



**TIME SAVERS
FOR
EDUCATORS,
ENGINEERS**

(A) 100 BLOCKS PER SQUARE INCH

This pattern is ideal for use by math teachers giving tests that require graphing. Electronic design engineers will find it excellent for plotting wave form patterns on cathode ray oscilloscopes, etc. Full pattern measures 3 inches square. Stamp prints one hundred $\frac{1}{10}$ " blocks per square inch. **No. 50,255 \$3.00 Postpaid**

(B) 16 BLOCKS PER SQUARE INCH

A pattern widely used in high school and college classes. For plotting in larger scale than with above stamp. Full pattern measures 3 inches square. Has sixteen $\frac{1}{4}$ " blocks per square inch. **No. 50,351 \$3.00 Postpaid**

(C) POLAR COORDINATE GRAPH STAMP

For curve tracing, for loci problems in polar coordinates, and in transformation problems between polar coordinates and Cartesian coordinates. 3-inch diameter circle with major divisions at 15° and small subdivision markings at each 5° . **No. 50,359 \$3.00 Postpaid**

LARGE INK STAMP PAD

Quality pad for use with any of the Edmund graphs listed. Measures $3\frac{1}{4} \times 6\frac{1}{4}$ ". **No. 60,134 \$1.50 Ppd.**

GRAPH STAMP SET

Set includes graph stamps (A), (B), and (C) plus stamp pad listed above. **No. 70,475 \$10.00 Ppd.**

CIRCLE STAMPS

Hundreds of class uses. For Sets or Venn Diagrams.

No. 60,260 Diameter 1" \$1.25 Ppd.

No. 60,261 Diameter 2" \$1.50 Ppd.

No. 60,262 Traditional Venn Diagrams \$2.00 Ppd.

CLOCK FACE STAMP

Stamp out 2"-diameter clock faces for each student to use in time-telling exercises. Design includes line below clock face for student to write in time you mark on clock, or vice-versa. **No. 60,143 \$1.35 Ppd.**

"BASICS OF DIGITAL COMPUTERS"—Murphy. 3 volumes. Easy-to-learn "picture book" form.

No. 9281 \$8.40 Postpaid.



SOMA WOOD BLOCK PUZZLE

Fourteen cubes make all sorts of fascinating structures. Make a tunnel, sofa, dog or skyscraper. Hannes Alven, the Swedish astrophysicist, showed that there are more than a quarter of a million ways to form a cube. Try some. Soma Cubes demonstrate an important educational fact . . . that solution is easier if you analyze construction than if you resort to trial and error methods.

14 (1") cubes. No. 70,262 \$2.00 Ppd.

100 ONE-INCH, COLORED WOOD CUBES

This fine set of number grouping material for primary work includes 25 blocks of each of the following colors: red, green, blue and orange.

No. 70,332 \$3.80 Ppd.

DEMONSTRATE THE "CUBE WITHIN A CUBE"

This set consists of 1 purple, 7 orange, 19 blue, 37 green and 61 red 1" wood cubes. Completed 5" cube shows in unmistakable visual fashion how 4" cube is contained within it. Shows how 3" cube is contained within 4", 2" cube within 3", finally how the single purple cube is contained within a 2". **No. 90,056 \$4.25 Ppd.**

12 WOODEN PUZZLES . . . BRAIN TEASERS

Here is a fascinating assortment of wood puzzles that will provide hours and hours of pleasure. Included are 12 different puzzles . . . animals and geometric forms to take apart and reassemble. Special design gives the whole family a chance to test their skill, patience, and most important of all, their ability to think and reason while having fun. Excellent amusement for recuperating youngsters.

No. 70,205 \$3.50 Postpaid

BOOKS—HIGH SCHOOL MATH REVIEW

COMPLETE PROGRAM . . . 8TH TO 12TH GRADE. Reviewing Preliminary Mathematics is 8th grade.

"Preliminary Mathematics". **No. 9272 \$1.50 Ppd.**

"Intermediate Algebra". **No. 9274 1.75 Ppd.**

"Reviewing Plane Geometry". **No. 9275 1.75 Ppd.**

"Reviewing Trigonometry". **No. 9277 2.00 Ppd.**

COLLEGE LEVEL BOOKS

"ANALYTIC GEOMETRY"—Oakley. For self-instruction or review. **No. 9262 \$1.50 Ppd.**

"PLANE AND SPHERICAL TRIGONOMETRY"—Nielsen and Van Lonkhuizen. Covers the usual college course.

No. 9261 \$1.75 Postpaid.

"MATHEMATICAL TABLES AND FORMULAS"—Carmichael and Smith. For students in all courses up to and including calculus. **No. 9371 \$1.25 Postpaid**

DESCRIPTIVE GEOMETRY

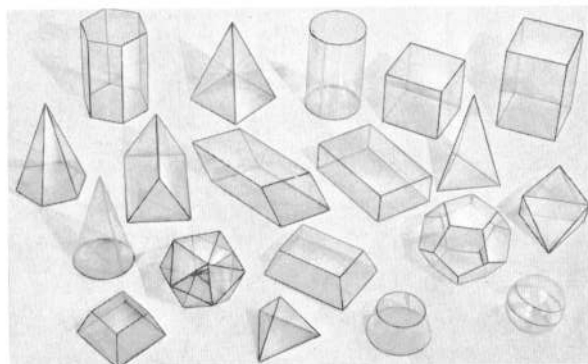
—Imre Pál

A most helpful text at any level of instruction in science and technology. It explains how (1) to represent spatial objects and forms, (2) to use constructive methods for solution of space problems, (3) to develop, a rich perspective ability . . . an ability to visualize. This text simplifies the subject by using 284 3-D figures (wear viewers to see them) plus 235 regular illustrations. Accepted by many high schools, boards of education, colleges and the branches of the armed forces, in the U.S.A. Imported, 196 pages, hard covers. Viewers included. **No. 9377 \$12.50 Ppd.**



GEOMETRIC SOLIDS

INEXPENSIVE, LARGE-SIZE DEMONSTRATION SET OF TRANSPARENT GEOMETRIC SOLIDS . . . \$39.50



19-PIECE SET

This jumbo set of geometric solids is accurately constructed and nicely finished.

Because they are made of transparent plastic, you can easily mark them, for demonstration purposes, with a china marking pencil. This is a valuable feature because it allows you to put formulas, dimensions, key letters, etc., right on the shape.

Edges are outlined in red for good visibility. Height of largest piece is $4\frac{1}{4}$ " ; the other solids are in exact proportion. Packed in sturdy, hardwood box, well-finished. Imported.

No. 70,314 \$39.50 Ppd.

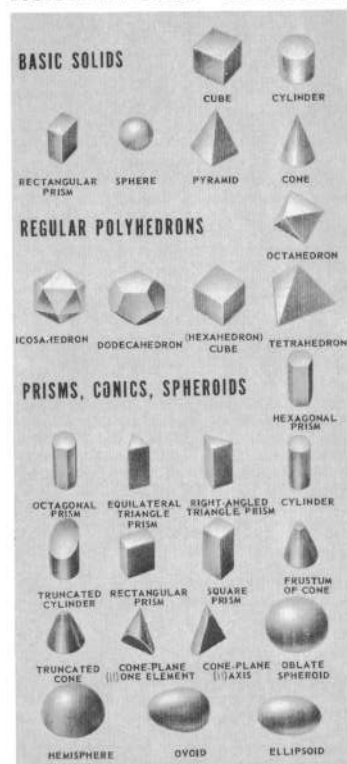
19 PIECE SET INCLUDES

Cube (or regular Hexahedron)
Regular Octahedron (8 sides)
Regular Dodecahedron (12 sides)
Regular Icosahedron (20 sides)
Right Circular Cone

Frustum of right Circular Cone
Right circular Cylinder
Sphere
Right prism with square base
Right prism with rectangular base
Right Hexagonal prism
Right Triangular prism

Regular Tetrahedron (4 sides)
Oblique Parallelepiped
Triangular Pyramid
Regular square Pyramid
Regular Hexagonal Pyramid
Frustum of Quadrangular Pyramid
Frustum of a square Pyramid

MINIATURE GEOMETRIC SHAPES . . . SET \$6.00 Ppd.



Geometry is the mathematical building tool of man. Without it we would not have our cities, our buildings, our bridges, our automobiles, or our explorations into outer space. All things about us that we can see, touch or move are three-dimensional.

These facts make an understanding of the geometry of space so vitally important. Now we are able to offer a truly fine, low-cost aid to visualize these realities.

Teachers with limited budgets and storage space will find these shapes an advantage in teaching visual concepts and geometry. Because of their low cost, each student now can have his own set. Tested and approved by Association for Childhood Education International.

Artists and students of mechanical drawing find them invaluable. Table top photographers use them to provide interesting, geometrical background shadows and shapes.

OTHER USES

- (1) Use with a light source to study the shadow patterns each solid has.
- (2) Models for tabletop photography, shapes and shadows.
- (3) Excellent for a science or knick-knack shelf.
- (4) Investigate why there are only 5 regular, convex polyhedra and no more.
- (5) Investigate the mathematics of crystals.
- (6) Identify each with objects found in our three dimensional world.
- (7) Investigate the "Burning Mirrors" of Archimedes, the principle of the "Whispering Gallery" etc.
- (8) Investigate the contributions to geometry of Euclid, Plato, Kepler, Cavalieri, Newton, Euler, etc.

MADE OF SOLID ORANGE PLASTIC

These three attractive, matched sets will take all the punishment even a class of youngsters can give. Each piece measures approximately $\frac{5}{8}$ " to $\frac{3}{4}$ " across its widest dimension and weighs from $\frac{1}{4}$ to $\frac{1}{2}$ oz.

Each set comes complete with detailed instructions for computing areas and volumes, also precise definitions of each shape, suggested uses and a long list of activities and projects.

27-Piece Set.

No. 70,615 \$6.00 Ppd.

Basic Solids (6 pcs.).

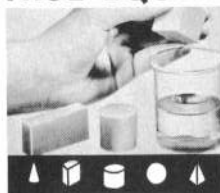
No. 60,249 \$1.50 Ppd.

Regular Polyhedrons (5 pcs.).

No. 60,248 \$2.50 Ppd.

Sixteen-piece Set, Prisms, Conics & Spheroids. **No. 60,342 \$2.50 Ppd.**

TRUE EQUAL-VOLUME GEOMETRIC SOLIDS SET



This inexpensive set simplifies learning and teaching the intricacies of geometry, physics and all the sciences involving three-dimensional shapes. Much better than even good drawings or perspectives. Subjects are grasped more easily and retained longer. At this low price you can have a set for school and home use.

Each of the solids is a cubic inch. Each will displace the same liquid volume. Perfect for demonstrating equal volume by liquid displacement. See illustrations.

Set of 6 basic shapes includes: cube, pyramid, sphere, cone, rectangle, cylinder. All are made of solid, durable plastic. "Science Teacher" magazine, in an article in their February, 1961 issue, recommended such shapes for use in biology courses.

Especially useful in Science Fair projects. Excellent for industrial training courses. Nicely boxed and complete with directions. **No. 60,250 \$3.00 Postpaid**

NEW! TRANSPARENT CRYSTAL MODELS...15-PIECE SET

It's easy for students, rock and mineral hobbyists to recognize the basic symmetries of these 15 most important crystal models—colored threads built into each indicate the position of all axes. The threads are black when all axes are identical; a red thread indicates a "c" axis; and a yellow thread indicates any third axis.

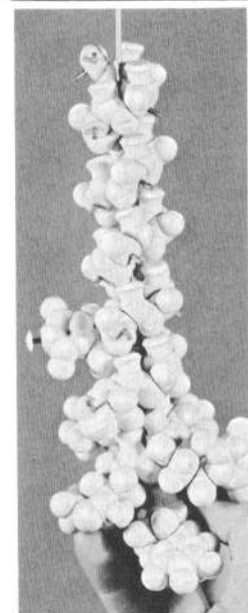
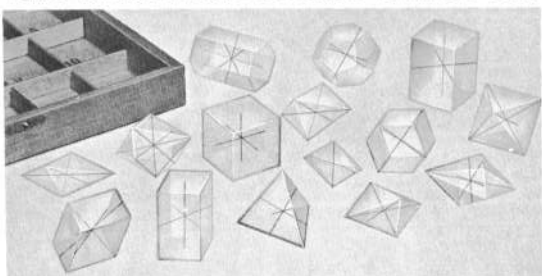
Transparent plastic, hollow models are ideal size for laboratory study, demonstration and exhibition. Cube measures 1 3/4". You can mark formulas, dimensions, key letters, etc. right on model with china marking pencil. Comes in compartmentalized, wooden storage case 12" x 9 1/4" x 2 1/4". Imported. Classification table incl. Contents of 15-piece set listed below:

Cube
Octahedron
Dodecahedron
Tetrahedron

Pyritohedron
Rhombohedral
Monoclinic Prism
Triclinic Pinacoid

Tetragonal Dipyramid
Tetragonal Prism & Pinacoid
Hexagonal Dipyramid
Hexagonal Prism & Pinacoid

Trigonal Scalenohedron
Orthorhombic Dipyramid
Orthorhombic Prisms & Pinacoid
No. 70,821 \$64.00 Ppd.



LANDE-EDMUND MOLECULAR MODELS

• QUICKLY ASSEMBLED,
DISASSEMBLED

• CONVENIENT SIZE

• AVERAGE ATOM
6MM RADIUS

• REUSABLE
CONNECTORS

• ACCURATE BOND
ANGLES

• PAINT OR MARK
WITH INK

• WASHABLE

• STRONG ABS PLASTIC

• WHITE SATIN FINISH

• INSTRUCTIONS

Everyone concerned with the biochemical and biophysical sciences should have the new Lande-Edmund Molecular Model Kit—especially those in commercial and institutional chemical laboratories, medical schools, drug companies, high schools and colleges. Study spatial relationships, steric hindrance, conformation of large molecules, bond angles, and intra-molecular distances. Amateurs, too, can now afford the best molecular model kit available for study of large complex molecules. Two kits and components available (see table and illustration).

Kit AA. Allows assembly of a tripeptide. 25 pieces—plus instructions. **No. P-40,825 \$10.00 Ppd.**

Kit BB. Allows you to build a polypeptide containing one of each of the common amino acids. 128 pieces—plus instructions. **No. P-70,802 \$45.00 Ppd.**

Separate Parts. Per package as in table. **\$2.00 Ppd.**
*This part, with male filler (P), makes amino group.

Kit	Quantity	Part	Separate Parts	
AA	BB	Item	Pkg. of	No. Price
4	23	(A) Methylidene	4	P-40,826 \$2.00
5	27	(B) *Methylene or Amino	5	P-40,827 2.00
2	10	(C) Methyl or Ammonium	6	P-40,828 2.00
2	20	(D) Peptide Bond (trans)	5	P-40,829 2.00
1	3	(E) Carbonyl	3	P-40,830 2.00
4	27	(F) Hydrogen	20	P-40,831 2.00
1	5	(G) Divalent Oxygen	6	P-40,832 2.75
1	3	(H) Divalent Sulfur	5	P-40,833 3.00
0	1	(I) Imidazole	2	P-40,834 2.00
0	1	(J) Indole	2	P-40,835 2.00
1	2	(K) Phenyl	2	P-40,836 2.00
0	2	(L) Guanido	2	P-40,837 2.00
0	1	(M) N-Terminal Prolyl	2	P-40,838 3.00
0	1	(N) Peptide Prolyl	2	P-40,839 3.20
1	5	(P) Filler—male	5	
1	5	(Q) Filler—female	5	P-40,841 2.00
4	25	(R) Connector dble. male	10	

For years scientists, teachers and students have been seeking accurate, easy-to-handle, and inexpensive molecular models for the study of large molecules. NOW, Dr. Saul Lande of Yale University has developed this series of small pregrouped clusters of atoms to meet these needs. Because of this pregrouping of atoms your cost and time in making a completed molecule is substantially less.

See Molecular Model Kits, page 29

EDUCATIONAL INSTRUCTIVES

- ELECTROMAGNETS
- DEMONSTRATION LENS SET
- ANATOMY MODELS
- ELECTROSTATIC GENERATOR
- "THINK STICKS"



Serving Education for 26 years. For over two decades Edmund Scientific Co. has been supplying science materials and equipment, math, optics and other educational items to the teaching profession.

Our former school catalog of "Instructives" presented less than half of our stock of merchandise. To serve the school market more completely we discontinued it and now mail our complete General Catalog instead. This particular section on instructives only covers a comparatively small group of teaching items. Please also refer to Mathematics, Science Fair Projects, Science Toys and Games, Solar Energy, Light Sources, Spectroscopes, Microscopes, Magnifiers, Magnets, Optics, Astronomy, Space Clock, Miscellaneous, and Last Minute Pages 5-13, 144.

Why schools and colleges across the country buy from Edmund. You Can Save Money Without Sacrificing Quality.

ELECTRIC CIRCUIT DISCOVERY KIT . . . \$6.25

Practical demonstrations to show operation of electrical circuits can easily be set up for the younger students with these materials. Complete kit includes: (A) 6 miniature receptacles, (B) 10 miniature lamps, (C) one double coil bell with high grade magnet wire coil, (D) 38 feet of red insulated #18 B & S wire, (E) 38 feet of white insulated #18 B & S wire, (F) single-pole switch, (G) double-pole switch, and (H) double battery holder.

No. 90,052 \$6.25 Postpaid



MAGIC DESIGNER "TOY" DRAWS OVER 1,000,000 ARTISTIC DESIGNS

Fun for children and the serious student. Use ball point pen or pencil to draw thousands of beautiful, useful patterns—and then color them. Turn crank to move geared turntable with circular paper attached; pencil holder with almost infinite adjustment moves over paper to form the highly intricate designs. This creative drawing toy doubles as an excellent math aid, producing many geometric figures. Durable metal construction with rubber feet, 13 1/4" x 7 1/4" x 8 3/4". With instructions.

No. 70,253 \$4.95 Postpaid

Package of Magic Designer Paper. 130 die-cut sheets.
No. 60,097 \$1.00 Postpaid



FLAGS OF THE 50 UNITED STATES

An excellent study aid and a nice decorating touch for den or children's room. Each is printed in full color on 2" x 2 3/4" rayon-satin fabric. Each with 5" staff and 1"-diam. base packaged in ploidium envelope. Complete set of 50 flags.

No. 60,460 \$2.75 Postpaid

Many items in this catalog meet the specifications of the C C S S O Purchase. Remember though, this guide is just that—any item that meets your requirements can qualify for N D E A matching funds, if it is part of a project application that meets with the approval of your State Educational Agency. Lower priced Edmund items will also make your N D E A matching funds go farther. **We guarantee satisfaction and prompt shipment on all purchases.**

Postpaid prices. Teachers and school officials greatly appreciate our policy of postpaid prices because it saves so much trouble. You know exactly the amount of your purchase. In numerous cases you save 10% or more over our competitors' prices because we pay postage.

Please refer to page 4 for complete ordering information applicable to teachers and educational institutions.

FUN TOY TEACHES PHYSICS TO 7-14 YR. OLD

Experimenter-science kit shows the junior scientist how mechanical force is transmitted, strengthened or changed to his advantage. Follow simple diagrams to show efficiency of plastic gears, pulleys, Geneva movement, ratchet, block & tackle in actual motion. Full explanations included.

No. 70,433 \$1.00 Ppd.

PROJECT THE GLORIOUS SPECTRUM

Separate white light as Isaac Newton first did 3 centuries ago. Turn sunshine into the beautiful colors of the rainbow, the spectral colors you study in physics and art classes. Use this 90°, ground-and-polished, optical glass prism (1 1/4" base). Slightly under Govt. specifications . . . a real value for studies. Blister packed on 4-color card with instructions.

No. 8100 \$1.00 Postpaid



DESIGN IN 3 DIMENSIONS WITH SPACE SPIDER



Designs that float in space can be made simply by weaving fluorescent strings between different planes. Engineering concepts can be vividly shown. It will provide hours and hours of creative fun for adults or children. Light it with "black-light" and create an incredibly beautiful sight. Kit contains 3 black notched wood background panels each 5 1/2" square, 3 reels of fluorescent thread (enough for countless designs) black clips, needle and instruction booklet.

No. 70,278 \$4.00 Postpaid

Specially priced classroom kit. Set of six Space Spiders packed together in one box. Save 1/3 when ordering this way. \$12.95 plus \$1.00 for Postage and Handling.

No. P-70,297 Total \$16.95 Postpaid

TWISTEE

A truly creative toy that aids in teaching coordination and creative craft work. Excellent for industrial designers. Keeps even the youngest children occupied for hours. Twists and turns in many shapes, a basket, a top, etc. Folds into flat 3" diam. circle.



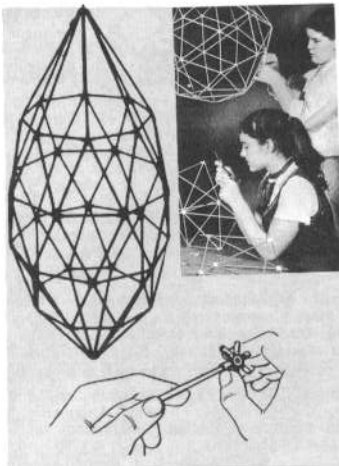
No. P-60,306 (Pkg. of 2) \$1.00 Ppd.

"THINK STICKS" THE MODERN KITS FOR INDUSTRIAL, EDUCATIONAL, FUN USES... VISUALIZE IN 3 DIMENSIONS

Here is the ideal visualizing and demonstration tool for teachers; learning aid for students in mathematics, physics, chemistry, design, and architecture. Excellent for Science Fair projects. Hobbyists and artists find them fascinating and extremely useful.

In mathematics, Think-Sticks Kits are used to construct geometric figures ranging from triangles and cubes to such multiple sided figures as icosahedrons and dodecahedrons. In design classes, models are made to determine functionalism and esthetic efficiency. Architectural and engineering instructors mock up girders, trusses, towers, frameworks; and demonstrate the nature and effect of stress. The State University of Washington, for example, is now using these in its Architectural and Engineering Laboratories.

Professional uses aside, Think-Sticks open new horizons of fun, knowledge and experimentation for any youngster. Ease of use and durability make Think-Sticks much superior to old-fashioned wood or metal kits. $\frac{1}{8}$ " diameter plastic or birch sticks fit smoothly into 1" polyethylene joints having $\frac{1}{8}$ " sleeves—form rigid structures. (Connectors can now be bought separately. T-connector supplied only with KIT No. 70,211.) Complete instructions included. Money-back guarantee.



KIT No. 70,209. Ideal introductory set. 220 pieces... 5, 6, & 8-sleeve connectors; 2, 3, 4, 5, 6, and 8" colored Think-Sticks. For all geometric structures and many artistic designs. **\$3.00 Postpaid**

KIT No. 70,210. Ideal for assembly of models, transmission towers, and for anyone with advanced interests. 370 pieces including 5, 6, 8-sleeve connectors; 2, 3, 4, 5, 6, 8, 10 and 12" colored Think-Sticks. Complete kit. **\$5.00 Postpaid**

KIT No. 70,211. Adequately fills the needs of schools, architects, designers, any group at the professional level. 452 pieces include 5, 6, and 8-sleeve; and T-connectors. (T-connector allows Think-Stick to pass clear through); 2, 3, 4, 5, 6, 8, 10 and 12" colored Think-Sticks; and long length of unpainted Think-Sticks which can be cut to any size required for your own designs. **\$7.00 Postpaid**

SEPARATE CONNECTORS, UNPAINTED STICKS

	(A)	(B)	(C)	(D)	
No.	Type	Pkg. of	Price		
P-60,108	(A) 5-sleeve	50	\$1.50 Ppd.		
P-60,109	(B) 6-sleeve	50	1.50 Ppd.		
P-60,110	(C) 8-sleeve	50	1.50 Ppd.		
P-60,111	(D) T-conn.	50	1.50 Ppd.		
P-60,112	24" Sticks	100	2.00 Ppd.		

EXPERIMENTAL ELECTRO-MAGNET RUGGEDLY BUILT

Hobbyists, science instructors, and those in industrial laboratories will find this well-built electro-magnet invaluable. Lifts up to 100 lbs. with $\frac{1}{2}$ -volt flashlight battery. Demonstrate the principles of electromagnetism. Turn the battery current on and you have a powerful magnet; disconnect battery lead and the magnetic pull ceases. Instructions included outline 6 significant experiments covering lifting power, magnetic flux and magneto-motive force, air gap, area of contact, retentivity and field configuration. Complete unit includes D.C. magnet and yoke assembly, battery holder, leads, clips and eye-bolts. Faces of steel core and yoke are ground for maximum flatness. About $2\frac{1}{2}$ " in diameter and $4\frac{1}{2}$ " long, wt. 2 pounds. **No. 60,435 \$12.00 Ppd.**



MAGNETO GENERATOR WITH LAMP

Telephone magneto generator on wooden base generates 75V-100V by turning crank. Includes standard lamp receptacle for classroom experiments. $4\frac{1}{8}$ " x $3\frac{3}{8}$ " high; may be somewhat different to that illustrated, but will function identically. **No. 50,365 \$11.95 Postpaid**



DC AMMETER & DC VOLTMETER
Registers from 0 to 10 volts; 0-10 amps. $2\frac{1}{4}$ " square. With mounting hardware. Ammeter has internal resistance of .0012 ohms; voltmeter resistance 100 ohms/volt.



No. 60,158 Ammeter \$2.25 Ppd.
No. 60,159 Voltmeter \$3.50 Ppd.

VAN DE GRAAF TYPE ELECTROSTATIC GENERATOR

Demonstrate lightning, lightning rods, St. Elmo's fire, repulsion of like charges, electrostatic dust collections, the classic "hair-raising" demonstration and flow of ions.

110-volt, 60-cycle, A.C. Humidity range; 0 to 90%. Up to 200,000-volt. Current: 1.5 to 2.5 microamp.

Base, housing, frame and charge collector are aluminum. Insulating column is unbreakable vinyl-chloride plastic. Height, 17"; diameter $6\frac{3}{4}$ ". With suggested experiments and instructions for care of apparatus. **No. 70,264**

\$43.50 Ppd.



See also Wimshurst Static Machine, Page 27.

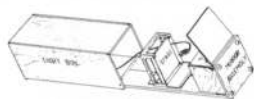
TESLA COIL FUN

Radiates high frequency energy through space... lights fluorescent tube 2 ft. away. Socket for standard bulbs enables you to connect these or similar



radiator to top of coil. 16-pg. instruction booklet includes 21 experiments such as: 1) ionization of gases by electrical stress, 2) wireless power transmission, 3) an ionic reaction motor, etc. High-frequency generator with coil, capacitors and transformer has ball electrode, insulative base, protective plastic cover and cord. With small neon lamp, discharge electrode, two radiation antenna plates. Generates 15,000 volts. For 110 V, 60C A. C. Measures 6" x 6". **No. 70,301 \$44.00 Ppd.**

EDUCATIONAL INSTRUCTIVES



OPTICAL KITS FOR "TOPS" CHEMICAL PROJECTORS

NEW Teacher's Model. For less than \$35.00 and 8 hours work you can build an overhead projector designed to Professor Alyea's specifications... project chemical experiments in daylight. New, improved optics kit includes powerful iodine-quartz lamp, special reflector assembly, 2 glass projection lenses, one plastic Fresnel condensing lens. Finished projector folds to 6¼" x 6¾" x 18". New instruction booklet with 250 experiments, No. 9372 not included (order separately below.)

No. 70,785 \$21.50 Ppd.

Replacement Lamp. No. 40,810 \$8.35 Ppd.

Optics Kit—Student's Model "Tops" Projector. Contains 2 glass projection lenses and 1 plastic Fresnel condensing lens... no lamp or reflector assembly. Not suitable for daylight projection. Order instruction booklet No. 9372 separately below. **No. 70,620 \$9.00 Ppd.**

Booklet "TOPS" (Tested Overhead Projection Series). By Dr. Hubert Alyea, Princeton University. 3rd edition. 240 experiments. Building instructions for teacher's and student's projectors. **No. 9372 \$3.50 Ppd.**

MAKE YOUR OWN NYLON—INSTANTANEOUSLY!

You saw it on TV and at the Du Pont exhibit at the New York World's Fair. Now do it at home! By mixing just 2 chemicals in the proper sequence, with a solvent and water, you can make nylon filament in an instant and continuously in the reaction vessel. Form long, shimmering nylon strands.



Though relatively safe, we recommend that children be supervised. Kit is miniaturized to reduce danger, includes polyethylene gloves, 2 chemicals, solvent, reaction vessel, stirring rod, 2 eye droppers, instructions and additional experiments. **No. 70,691 \$4.95 Postpaid**



STUDY PHOTOTROPIC EFFECTS

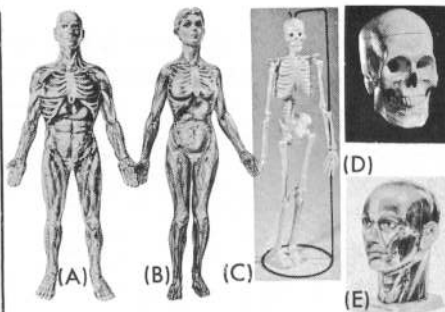
New variable transmission filters darken instantly and develop color when struck by bright light. Kit contains Corning's new phototropic glass; medium and high-speed, phototropic plastic; and 3 ampoules of colorless phototropic solutions which instantly turn red, green or violet when exposed to photoflash unit included. They reverse in 30-60 seconds! Can be cycled 500 times or more! Exposure can also be by sunlight or U. V. lamp (see No. 70,364, pg. 99). Ultra-violet cut-off filter included can absorb part of wave-lengths. Also reversible phototropic paper and sample of tenebrescent mineral Hackmanite... can be cycled thousands of times; flash unit with 15-volt battery, capacitor, and 12 AG1 bulbs; booklet "Photochemistry, Phototropy and Tenebrescence"; instructions and experiments.

No. 70,727 \$29.50 Postpaid

Booklet only. No. 9073 \$1.00 Postpaid

Low-Cost Filters only. Light green plastic filters, 2½" in diam. Adjust to varying intensities and return to normal color. Slight rejects because of small scratches, etc. Directions included.

No. P-40,783 (Pkg. of 2). \$1.00 Ppd.



HUMAN MODELS IN PLASTIC

(A) **Visible Man.** This authentic, take-apart model of the human male stands a full 16" high.

No. 70,228 \$6.00 Ppd.

(B) **Visible Woman.** Matching model of the human female, 15½" high.

No. 70,283 \$6.00 Ppd.

(C) **Scale Model of Human Skeleton.** Completely assembled. So accurate it is approved for school purchase under the National Defense Education Act. (No. 2800 CSSO Guide.) Tough, pliable polyethylene 12" high.

No. 90,022 \$5.00 Ppd.

(D) **Life Size Human Skull.** Plastic skull on stand. With full instruction kit.

No. 70,294 \$4.95 Ppd.

(E) **Visible Head.** This accurate, take-apart model conforms to rigid lab standards. Teeth can be removed, eyes can be disassembled. All in vivid detail, with handbook by medical authorities.

No. 70,447 \$12.00 Ppd.

ANATOMY STUDY CARDS

Each set has 21 laminated cards. **Bones, Muscles, Muscle Insertions.** 3½" x 2".

No. 60,183 \$2.50 Ppd.

Arteries, Veins, Nerves and Lymphatics. Beautiful color printing. 3½" x 2½".

No. 60,184 \$2.95 Ppd.

Comparative (Cat, Necturus, Frog and Shark). 3½" x 2½".

No. 60,185 \$2.50 Ppd.



LARGE HUMAN ANATOMY WALL CHARTS

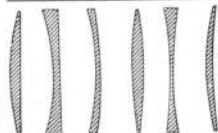
Teach or learn about the amazing human body with these 14 large 29" x 27" visual aids. Printed in color on heavy paper with all important parts named. Students grasp and learn essential points so much faster. Set of 14 charts include skeletal, muscular, circulatory, nervous, endocrine, reproductive systems, heart, lungs, brain, nose-mouth-throat, position of organs, how muscles operate, main arteries and veins, and comparison of male and female structures.

No. 70,897 \$9.95 Ppd.



DEMONSTRATION LENS SET

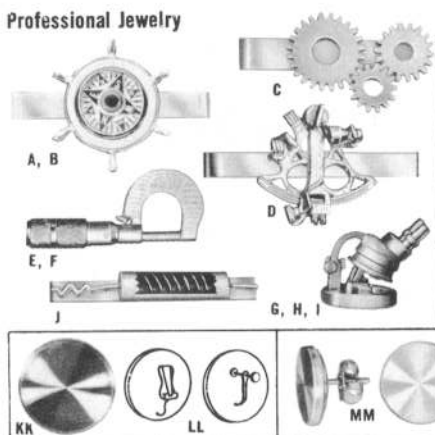
Each has 8" focal length. For individual projects and classroom experiments. This set of six lenses (all 5 cm. diam.) conforms to the



standards set up by the CSSO Purchase Guide for a demonstration lens set (item #2235). One of every type of lens is included. Show the class how the behavior of light varies as it passes through each lens. Included are: plano convex, plano concave, convex-concave, double convex, double concave, and concave-convex.

No. 40,414 \$5.00 Postpaid

Professional Jewelry



Diffraction Jewelry



WEAR UNIQUE, SCIENTIFIC DIFFRACTION JEWELRY

Its constantly changing, rainbow hues create attention and admiration. Blends with any coloring, for casual or formal wear. Thanks to a scientific phenomenon, the diffraction of light, spectral colors of red, orange, yellow, green, blue, indigo and violet, reflect from the

... AMAZING RAINBOW COLORS

surface. New developments enable us to offer these items in GOLD or SILVER finish. The jewelry has 15,000 circular grooves to the inch. These grooves diffract the light to produce rainbow colors.

An interesting sheet explaining this background is included with each piece of jewelry. All prices postpaid.

FOR MEN

Finish	Gold			Silver			Price
Jewel Size	1/2"	3/4"	1"	1/2"	3/4"	1"	Ppd.
(AA) Tie Clasp	1838	1837		1726	1727		\$1.50
(BB) Cuff Links		1828			1713		2.00
(CC) Key Chain			1824			1733	1.50
(DD) Tie Tac	1855			1776			1.50

FOR LADIES (Earrings)

Finish	Gold			Silver			Price
Jewel Size	1/2"	3/4"	1"	1/2"	3/4"	1"	Ppd.
(KK) Clip type			1815			1703	\$2.00
(LL) Screw type			1813			1707	2.00
(MM) Pierced Ear (14K gold posts)			1860			1782	2.25

FOR LADIES (Pins)

Finish	Gold			Silver			Price
Jewel Size	3/4"	1"	1 1/4"	3/4"	1"	1 1/4"	Ppd.
(EE) Swirl		1809			1761		\$2.00
(FF) Wreath		1836			1777		2.00
(*) Musical Note		1865			1787		2.00
(GG) Modern Cat		1868			1790		2.00
(HH) Kitten		1867			1789		2.00

*Not illustrated

Optical Psychedelic Jewelry "breathes" motion.
It's new; excites, stimulates. See page 20.

PERSONAL JEWELRY FOR PROFESSIONAL PEOPLE AND CAREER STUDENTS

Professional Jewelry. Carefully fashioned by expert craftsmen, these unique jewelry items are quite different and distinctive. They tastefully express your individual profession, interests and ambitions. Compasses actually work.

Item	No.	Price	Ppd.
(A) Compass Tie Bar (SF)	1846	\$5.50	
(B) Compass Tie Tac (SF)	1847	5.00	
(C) Gears Tie Bar (SOF)	1840	1.75	
(D) Sextant Tie Bar (GPF)	1844	1.75	
(E) Micrometer Tie Tac (GPF)	1849	1.50	
(F) Micrometer Tie Bar (GPF)	1843	1.75	

*Not illustrated

Item	No.	Price	Ppd.
(G) Microscope Cuff Links (GPF)	1850	\$2.75	
(H) Microscope Tie Bar (GPF)	1839	1.75	
(I) Microscope Tie Tac (GPF)	1848	1.50	
(J) Resistor Tie Bar (S & BF)	1845	1.25	
(*) Stethoscope Tie Bar (GPF)	1842	1.75	
(SF) Silver Finish, (GPF) Gold Plated Finish, (S & BF) Silver and Black Finish, (SOF) Silver Oxide Finish.			



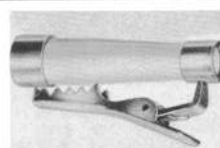
SLIDE RULE TIE CLASP FOR THE MATH MINDED

Ideal for engineers or students. It actually works. Movable, clearly calibrated rule in attractive silver oxide finish. Sharp blue numerals. Only 2" wide.

No. 1775 Now only \$2.25 Ppd.

THERMOMETER TIE CLASP. Good looking, functional and surprisingly accurate. 1 1/2" long. Boxed.

No. 1774 Now only \$1.00 Postpaid



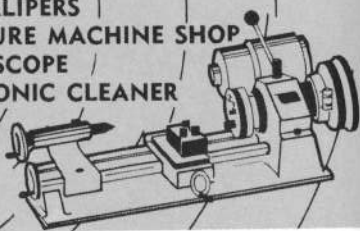
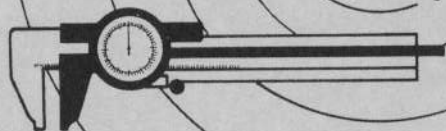
NEW! 3X TELESCOPE TIE CLASP

Bring distant objects three times closer with this unique, miniature telescope. It's the most talked about tie clasp we have seen. A real bargain at \$2.25... and just the thing for the man who has everything. Telescope measures 1 1/2" long. Body is tastefully enameled in white with chrome trim on both ends. Carry your private "snooper" with you wherever you go. Attractively gift boxed.

No. 1870 \$2.25 Ppd.

TOOLS

- DIAL CALIPERS
- MINIATURE MACHINE SHOP
- STETHOSCOPE
- ULTRASONIC CLEANER



ULTRASONIC CLEANERS . . . Inexpensive Models

- Unbeatable for cleaning small delicate parts of infinite variety
- Clean inaccessible areas where all other methods fail
- No tubes or transistors
- 1 pint to 1½ gallon sizes

These systems consist of a powerful generator with an output of 80,000 cycles per second. This higher frequency cleans more efficiently. Handles very delicate specimens (jewelry, optics, dental and other labs., small industrial parts) without submitting them to vibration or bounce. Parts are "scrubbed" by waves in the tank's cleaning fluid, waves produced by high-frequency alternating current converted to mechanical energy. Units have automatic 5-minute time switch; black, baked enamel finish; one-knob control. Stainless steel tanks. Operate on household current, 105-125 volts, 50/60 cps.

One Pint Capacity Tank (illustrated) . . . Lowest priced, self contained unit we know of. Tank interior measures 3½" long x 3½" high by 2½" deep, 40 watt generator measures 4¾" high x 9½" wide x 5" deep. Wt. 6 lbs.

No. 70,978 \$69.95 Postpaid

Half Gallon Capacity Tank . . . Interior measures 5¼" long x 5¾" wide x 4" deep. 80 watt generator unit measures 12" long x 9¾" wide x 7" high, weighs 28 lbs., 6 oz. cleaner included.

No. 85,126 \$129.95 Trans. Charges Col.

Chrome Dip Basket for above. Weighs 2 pounds.

No. 85,127 \$14.95 Trans. Charges Col.

One and a Half Gallon Capacity Tank . . . Ideal for larger industrial items. Interior measures 12" long x 6" wide x 6" deep. 120 watt generator measures 12" long x 9¾" wide x 7" high, weighs 36 lbs., 6 oz. cleaner included.

No. 85,128 \$249.95 Trans. Charges Col.

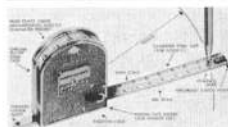
Ultrasonic Cleaner . . . Quart size in polyethylene bottle. For general cleaning of water soluble contaminants such as buffing compounds, fingerprints, animal and vegetable oils, etc. Weight 1 pound. **No. 70,426 \$3.00 Ppd.**



PROTECT YOUR EYES

Be safe from flying chips, dirt and dust. Wear these non-flammable, impact-resistant safety goggles with or without glasses. Adjustable headband.

No. 70,596 \$1.40 Ppd.



MM AND INCH STEEL TAPE

With window—draw large circles.

This new 6½-ft. tape reads off inside measurements (where case is included) through clear plastic window on top. Reads in both millimeters and inches, and locks so you can scribe straight lines or draw circles. Compass hole in tape end and flip-out center point on case bottom. Graduated in ¼ths to 6½ ft. and in mm to 2 meters; both scales printed on both front and back. Chrome plated steel case with long-life, nylon tape guide. Precision made in France. **No. 40,882 \$3.29 Ppd.**

USE THIS EXTREMELY SENSITIVE CIRCULAR LEVEL THROUGHOUT THE HOME & SHOP

For leveling in all directions with one fast reading. A handy tool in the home or factory. When bubble is centered, base of instrument is entirely level. Use it on cameras, telescopes, or industrial instruments, for leveling appliances, your Hi-Fi turntable, also for model making, train layouts, etc. Diameter 1". Acute sensitivity of 45 minutes, plus or minus 10%, for each 1" movement of bubble.



No. 40,068 \$1.85 Ppd.

THE DEVIL LEVEL



Reads angles up to 40° and inch rise per foot up to 10". True level or inclination at a glance. Square plastic case permits leveling from top, side or bottom . . . mounts easily in frame or wood span bar for leveling over long surfaces. Bob floats in self sealing liquid plastic.

No. 60,046 \$2.00 Ppd.

HAND SIGHTING LEVEL



Handy little instrument for laying out gardens, drives, new construction, ditches, etc. Sight it like telescope. Accurate within ¼ of 1°! When images of bubble, reticle horizontal line and object are coincident, object is level with eye of observer. Measures differences in elevation between two points. **No. 105 \$3.50 Ppd.**

ABNEY REFLECTING HAND LEVEL

Improved model enables more accurate calculations. Use as clinometer, or for measuring angles. Graduated from 0° to 60°-1 to 10 minutes. Arc swings from 0° to 90°. Adjustable bubble level. Leather case and shoulder strap. Length 5". Instructions incl.



No. 50,016 \$14.95 Ppd.

PERFECT "THIRD HAND" JIG



Invaluable for gluing, soldering, fabricating, inspection, etc. Two 5½" steel arms, with adjustable ball joints, hold small work in varied positions. Each has self-closing, heat-resistant jaws ¼"x¾" long. Base, 2¾" diam. Wt. 9 oz. All chrome. Excellent for "clean room" use. Imported.

No. 40,755 \$19.95 Ppd.

0-10 CENTIMETER TAPES

Extremely useful. Roll of 50 pressure sensitive 0-10 centimeter tapes, white background, black scales.

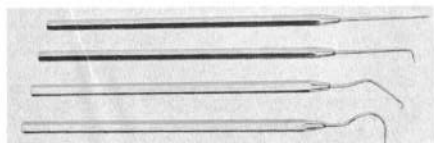
No. 40,269 75c Ppd.

STAINLESS STEEL COMPARISON RULE



6" steel rule for measuring in either millimeters or inches. Use it for converting from millimeters to inches or vice versa. Inch face divided into 16ths on one edge and 32nds at the center line.

No. 40,073 50c Ppd.

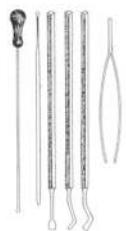


NEW! HANDY, STAINLESS STEEL PROBES

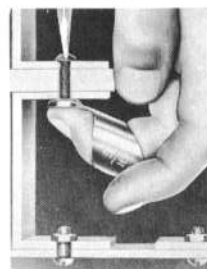
Craftsmen, hobbyists and instrument makers and lab men find them invaluable. Excellent for micro-miniature and electronics work of all kinds, for inspection and soldering, for work in metal, plastic, wood, leather, clay and stone. Set of 4, all approx. 5½" long. Same as your dentist uses. **No. P-40,963 \$4.50 Postpaid**

DENTAL TOOLS . . . YOU'LL USE THEM TIME AND AGAIN

We have combined surplus instruments with manufacturer's close-outs to bring you this set at a remarkably low cost. Ideal for craftsmen, instrument makers and hobbyists. Ideal for working in metal, plastic, wood, leather, clay and stone, etc. Consists of six instruments. Contents will vary. They may be similar, but not necessarily identical to the items illustrated.



No. 30,351 \$3.75 Ppd.



FINGERTIP WRENCHES

Just touch and hold. Set of wrenches combines the advantages of using your own sense of touch and the solid grip of the end of a wrench. One finger operation. Worn like a ring, they do not restrict free motion. Adjust to fit any size finger. Set consists of four sizes: ¼", ⅜", ½" and ¾" for No. 4, 5, 6, 8 and 10 nuts and hexagonal bolts. High quality stainless steel.

No. 50,348 \$2.50 Postpaid



CARBIDE SCRIBER

Perfect for engraving on metal, glass, gems and plastics. 5½" long. Can also be used as glass cutter. With pocket clip. Magnetized tip for retrieving small parts. Replaceable tip can be reversed to prevent damage when in pocket.

No. 40,594 \$2.25 Postpaid

Replacement Tip No. 40,595 \$1.00 Postpaid



PROTECT, PERSONALIZE AND BEAUTIFY OBJECTS W/ELECTRIC ENGRAVER

Write your name and other important information on metal, wood, plastic, almost any hard surface. Hardened steel point writes on tools, rings, cameras,

trash cans, etc. Protect your property from theft. Engrave artistic designs on glass, wood, plastic, stone or metal. Completely automatic. Pick it up—it's on. Put it down—it's off. Control for depth of cut. No heat. 5½" long, 110 volt, 50-60 cycle A.C. motor, 6' cord and plug. Weighs 10 oz.

No. 60,631 \$8.95 Ppd.

DIAL-READING CALIPERS WORKS WITH FAST, FOOLPROOF ACCURACY



Much easier and faster to use than regular calipers or micrometers. Inspectors, toolmakers, machinists, patternmakers and serious hobbyists can truly appreciate it. Takes both inside and outside plus depth measurements . . . all can be read from dial in .001" and estimated to .0005" (guaranteed accurate to .001"). Beam graduated in inches and tenths of inch.

Extra long jaws, 4" capacity, insure perfect alignment. Thumb roll, fine adjustment has a slipping feature that prevents forced readings; thumb nut permits locking in any position. Completely rustproof . . . all stainless steel with satin-chromed finish. Working components covered to shut out dirt. Adjustable dial permits resetting. 7" long x 2½" wide. With rugged leather case. Imported. Bargain priced.

No. 60,452 \$19.25 Ppd.

Dial-Reading Metric Calipers. As above, but with dial graduations from 0 to 10mm in 0.1mm divisions. Can easily be read to an accuracy of 1/10mm. 7" x 2½" wide. Beam scale graduated 0 to 100mm in 10mm divisions. Maximum capacity 0 to 105mm (outside length and depth), 5 to 110mm (inside length).

No. 60,509 \$21.00 Postpaid



INEXPENSIVE 5" VERNIER CALIPER

For all hobbyists and students. Fully enclosed sliding head, inside and outside jaws, depth gauge, sensitive roller adjustment and locking lever for gauging purposes. Graduated in ¼", ½" and in 1 mm to 140 mm. Vernier reads to 1/128" and 0.1 mm. Well constructed of special drawn steel. 7½" long x 2½" wide. Complete instructions. **No. 40,598 \$2.00 Postpaid**



NEW VERNIER MICROMETER WITH CARBIDE FACES

• Reads to one ten thousandths of 1"

Made to highest standards of accuracy. Measures from .0" to 1" and is accurate to .0001" . . . parallelism to .00005". Friction thimble on barrel end insures precise measurement . . . no forced readings. Anvil and spindle of micrometer steel are hardened and ground . . . precision measuring faces of tungsten carbide. Vernier scale on barrel has every ten thousandth numbered; scale on thimble graduated in thousandths, numbered every five. Finished in dull chrome, frame in baked black enamel. Adjustable nut, positive locking clamp. Wt. 5½ oz. Fitted wooden case, adj. wrench, inspection certificate.

No. 60,524 \$16.50 Ppd.

STUDENT MICROMETER



• Reads to one thousandth of one inch. An inexpensive beginners' micrometer for students, technicians, hobbyists, to learn fundamentals of use and technique. Has adjustable anvil. Capacity 0" to 1". Accuracy of .001".

No. 60,666 \$3.75 Postpaid



HEAVY DUTY PENCIL COMPASS & DIVIDER

Tool steel point and tempered steel spring for accurate adjustment. Draws circles to 8" diam.

No. 40,599 \$1.00 Ppd.



The basic Unimat turns, faces, bores, recesses, parts-off, polishes . . . in less than a minute it converts to a vertical machine for milling, drilling, jig boring and surface grinding. This precision unit is so simple in design that anyone can soon perform all basic ma-

12 Most Popular Attachments and Accessories

SHIPPING CHARGES INCLUDED IN PRICE

Power Feed Lathe Attachment (DB 1290). Gives 1:50 reduction. **No. 70,843 \$21.00 Ppd.**

4-Jaw Independent Lathe Chuck (DB 1002). Capacity 2 1/4". **No. 60,583 \$24.75 Ppd.**

Ball Bearing Live Centers. Aid high speed operations. Single-Row (DB 1220). **No. 40,924 \$4.75 Ppd.**

Double-Row (DB 1221). **No. 40,925 \$6.25 Ppd.**

Circular Saw Attachment (DB 1240). (Order headstock raising block below.) **No. 70,844 \$16.25 Ppd.**

Saw Blades for No. 70,844

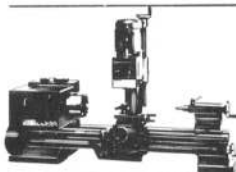
2 1/2" diam. (wood) **No. 40,972 \$1.75 Ppd.**

3 3/4" diam. (wood) **No. 40,973 2.10 Ppd.**

2 1/2" diam. (metal) **No. 40,971 2.50 Ppd.**

Milling Table (DB 1210). Essential milling aid, 3" x 5", with clamps. **No. 60,585 \$13.50 Ppd.**

3-Jaw Universal Chuck. 2 1/4" capacity (max.), reversible jaws. Complete with back-plate adaptor for mounting on spindle or tailstock. Tightening bars incl. **No. 60,659 \$26.00 Ppd.**



MAXIMAT 7

New, multi-purpose precision machine, functions as lathe (7" swing), vertical miller, drill press. Write for Bulletin No. 72. **No. 19,086. \$565.00 F.O.B. N.Y.**

POSITION & START SCREWS IN TOUGHEST SPOTS

Twist of the high carbon steel bit holds screw firmly, ready for trouble-free starting or retracting. Tools release automatically, reset with a twist. Light weight handles of knurled Duraluminum. Head ends have powerful 1" Alnico magnets to retrieve. For standard slotted screws. 5 3/8" long. **No. 60,514 \$1.65 Ppd.**

For Philips Head. **No. 60,515 \$2.50 Postpaid**



PRECISION MACHINISTS' SQUARES

Designed for precise layout and measurement work. Both beam and hardened blade ground and lapped for straightness and parallelism. English made of finest Sheffield steel. 6" blade, 4" beam.

No. 60,523 \$5.00 Ppd.

No. 40,804 \$3.50 Ppd.

4" blade, 3" beam.

chining operations with professional skill and ease.

Headstock rotates 360°, is detachable and converts in seconds to vertical miller, drill press, surface grinder. Headstock spindle has radial thrust ball bearings with lever-activated, quill feed of 3/8". Spindle return spring. Spindle is belt driven; maximum runout guaranteed no more than .0005" when turning between centers. Machine castings of high-grade, seasoned cast iron. Pulleys and handwheels of strong duraluminum.

SPECIFICATIONS: Swing over bed 3", over cross slide 1 6/10"; distance between centers 6 9/10". In vertical use, distance from spindle nose to cross slide 6 1/4", from drill to center of circle 6 1/8". Headstock rotates 360°, has 1/4" spindle bore, 3/8" feed. Tailstock travels 6 1/2", spindle 3/4". Carriage travels 6 1/2", cross slide 2". Tool post centers 1/4" bits, but has 3/8" capacity. Handwheel has .002" graduations. 1/10 HP motor for 110-V, AC/DC provides 11 speeds from 900 to 1200 rpm.

Imported from Austria. With one 1/4" roughing bit, tool post, 3-jaw drill chuck with key, face plate, 2 dead centers, lathe dog, grinding wheel arbor, vertical column and headstock adapter, drive belts and motor, 40-page instruction manual and wooden storage cabinet. Shpg. wt. 30 lbs.

No. 85,175 \$139.50 Trans Charges Collect

Headstock Raising Block & Clamping Bolt (DB 1311). Increases swing to 4 3/4", permits use of saw attachment above. **No. 40,926 \$2.50 Ppd.**

Machine Vise (DB 1010). Mounts on lathe cross slide; milling table or indexing head round table. V-milled jaws, 1 1/8" capacity. **No. 60,584 \$10.00 Ppd.**

Indexing and Dividing Attachment (DB 1260). Mounts vertically or horizontally on cross slide, includes 48-division index plate. **No. 60,587 \$15.92 Ppd.**

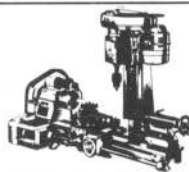
Round Table (DB 1261). Clamp large or irregular work for dividing. **No. 60,586 \$7.25 Ppd.**

Lathe Tool Set (DB 1100). Six precision ground, 1/4" H.S.S. bits most commonly used. **No. 40,927 \$11.50 Ppd.**

Drive Belt Set (DB 5100). New heavy-duty, long-life type; one large, one small. **No. 40,928 \$3.50 Ppd.**

Miniature Machining Techniques, for beginners and experts. Covers use of UNIMAT and accessories, 40 pages, 8 1/2" x 11", over 200 illust. **No. 9378 \$1.00 Ppd.**

NOTE: For variable speed control, see Vari-Volt (53).



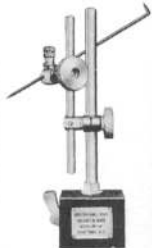
MAXIMAT 10

Similar features to Maximat 7, but larger capacity (10" swing). Constructed for precision experimental shop work. Write for Bulletin No. 71. **No. 19,085. \$1350.00 F.O.B. N.Y.**

MAGNETIC BASE HOLDER COMPLETE WITH SCRIBER

Holds all types of dial indicators and scribers. Has two magnetic surfaces, on bottom and on back side. Handle turns magnets on & off, variable strength up to 66 lbs. Rod travels 6 in. Accommodates scriber up to 3/32" in diam. Scriber included. Height 13 1/2"; base 2 1/4" x 1 1/2". Weight 3 pounds. In attractive, fitted wood case.

No. 70,619 \$15.75 Ppd.



LEAKPROOF 1/2-OZ. OIL CAN

Twist opens or closes. Delivers one drop of oil for precision lubrication. Made of chrome-plated brass. **No. 60,018 \$1.15**





VICE WITH NEW VACUUM-BASE...

**Take Right to the Job
... Attaches Instantly
Securely ... Slip-On
Rubber Jaws**

Apply slight pressure to top of vise and push down lever. This raises center of heavy rubber base plate and creates the vacuum that anchors vise to almost any smooth, non-porous surface—formica, linoleum, metal, porcelain, glass, etc. Mounts horizontally, vertically, even upside down. No screws or clamps.

Simply lift lever to release vacuum grip. Removable, metal V-groove jaws have $2\frac{1}{2}$ " x $\frac{5}{8}$ " face. Slip-over rubber jaws for delicate work. All-metal construction with blue, baked enamel finish. Height 4"; $4\frac{1}{2}$ " x 5" base.

No. 70,814 \$7.95 Ppd.

Versatile Vacuum Base. Flat top base works like one attached to vise above; makes tools, instruments, appliances fully portable yet attachable. Mounts horizontally, vertically, even upside down.

No. 60,567 \$3.50 Postpaid

Photographers! See base with camera head, page 106.



MINIATURE TOOLS KIT

Contains six miniature tool sets for electronic and aeronautical technicians, automotive mechanics, instrument makers and mechanically minded hobbyists.

Miniature Socket Wrench Set. Five hex sockets... $\frac{3}{16}$ ", $\frac{1}{4}$ ", $\frac{5}{16}$ " and $\frac{3}{8}$ " with magnetized knurled handle. Two-jaw chuck locks sockets firmly... won't slip in use. Magnetized handle with recessed rotating finger rest.

Miniature Tap Set. Five, fluted taps ground from tough heat-treated steel. Two-jaw chuck locks each firmly. Tap holder has recessed finger pad, also hole for torque bar (tap shank fits it). Chart below shows thread and drill sizes.

Tap No.	0	1	2	3	4
T. P. I.	80NF	72NF	56NC	48NC	40NC
Drill Size	#56 ($\frac{3}{16}$ ")	#53	#50	#47	#43

Jeweller's Screwdriver Set. Five, heat-treated, interchangeable blades. These quickly chuck into screwdriver head. Swivel top for easy turning.

Miniature Drill Set. Five twist drills, sizes $\frac{3}{16}$ ", Nos. 53, 50, 47, 43.

Miniature Wrench Set. Includes Nos. 0 and 1 Phillips, Nos. 4, 6, 8 Allen wrenches.

Miniature Offset Wrench Set. $\frac{3}{16}$ ", $\frac{1}{4}$ ", $\frac{5}{16}$ ", and $\frac{3}{8}$ ".

All of the above are quality tools that can easily be carried in pocket or kit. Each set is supplied in individual bench top holder with see-through, dust-tight, cover. All six sets in sturdy, simulated leather case.

No. 70,856 \$22.95 Ppd.

Individual Sets Available Separately

Miniature Socket Wrench Set.	No. 60,341	\$3.95 Ppd.
Miniature Tap Set.	No. 60,340	\$6.95 Ppd.
Jeweller's Screwdriver Set.	No. 60,017	\$1.75 Ppd.

Flexilight illuminates inaccessible areas, page 147

HOBBYIST'S BARGAIN! CARVE, DEBURR, ETC. SURPLUS BURRS



For miniature machining of plastics and soft metals, wood carving, bas relief, linoleum block cutting, etc. Brand new. For carving, micro-milling and slotting, engraving, deburring. Use in hand grinder, portable drill, drill press, milling machine or our UNIMAT miniature machine shop. Six burrs each: #8 round, #39 inverted cone and #59 crosscut figure. All $\frac{7}{8}$ " long with $\frac{3}{32}$ "-diam. shafts.

No. P-40,880 \$2.00 Ppd.

BEND WIRE INTO USEFUL THINGS



Turn wire, coat hangers, etc. into peg board hardware, stakes, springs, tools, toys, art. New cast aluminum jig with cutting blade, fulcrum & bending pins handles up to $\frac{1}{4}$ " steel wire. 100 illustrated projects.

No. 40,870 \$2.00 Ppd.

Without fulcrum and cutter. 27 projects.

No. 60,332 \$1.00 Ppd.

ABRASIVE BLOCKS MAKE SANDING EASIER

Set of 3 (240; 120 and 50 grit) flexible, semi-soft abrasive blocks clean and polish to a satin finish. One block is equivalent to 43 sheets of 10" x 10" sandpaper. Great for industry, garages, workshops, and households. Easy to use, wet or dry. Unaffected by oil. Will not clog. Smooth metal, paint-work, wood, plastic and other materials. Hand sizes, 3" x 2" x $\frac{3}{4}$ ". Set of 3 blocks with instructions.

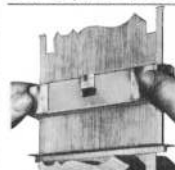
No. P-60,642 \$4.50 Ppd.

ECONOMY STETHOSCOPE

Here is a real bargain! Diagnose engine troubles, check strains and leaks. This stethoscope, at about half the ordinary cost, will prove extremely useful in detecting fluid, air and gas leakage. Will repay its cost in one or two uses. Auto repair shops will find it particularly helpful. Many hobby applications and educational uses.



No. 50,223 \$3.25 Ppd.



NEW MAGNETIC INSTANT CONTOUR GAGE

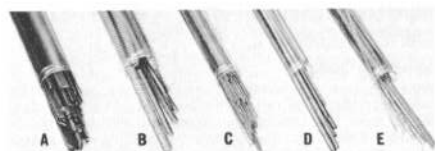
- Instantly forms complete contours
- Instantly locks copied contours without distortion
- Only gage that instantly measures any separate portion of copied contour

... directly Forms both inside (match) and outside (fit) profiles with a single motion of the magnetic rod holder. Unlike other gages, you never touch a single rod! Each rod rides in its own track; held by three, permanent ceramic magnets.

Unequaled for woodworking, metalworking, plastic fabricating, etc. ... Transcribe or use gage as template ... simply flip lever to lock contour. Outstanding direct reading scales for horizontal and vertical measurements of any portion of contour. Read from either end to accuracy of $\frac{1}{32}$ ".

Realize rods instantly ... simply draw rod holder toward flat surface. Forms and measures contours up to 5" long x $2\frac{3}{4}$ " high. Stainless and chrome-plated steel. 160 plated and tempered wire rods. Guaranteed 1 year against defects. Case and instructions included.

No. 60,507 \$13.95 Postpaid



HARD-TO-FIND SPRING & STOCK ASSORTMENTS

Save time and money with these five useful assortments of flat spring steel, compression and expansion springs, round music and brass spring wire. All supplied in convenient 12" lengths. Just cut the size you need. Invaluable for the experimental shop, industrial maintenance, gun and locksmiths, instrument repair, hobbyists, etc. Packaged in see-through plastic tubes to show how much stock you have on hand.

- (A) 100' Assorted Flat Spring Steel Strips, $\frac{1}{4}$ " to $\frac{3}{8}$ " width, .016" to .059" thick. **No. 60,618 \$4.00 Ppd.**
 (B) 12 Assorted Compression Springs, wire sizes .016" to .058" thick, O.D. .091" to .312". **No. 60,622 \$3.50 Ppd.**
 (C) 100' Music and Brass Spring and Round Wire. Asst'd. diam. from .020" to .062" thick. **No. 60,619 \$3.50 Ppd.**
 (D) 12 Assorted Extension Springs, wire sizes .016" to .020" thick; O.D. .086" to .187". **No. 60,620 \$3.50 Ppd.**
 (E) 12 Assorted Compression Springs, wire sizes .110" to .210" thick; O.D. .091" to .312". **No. 60,621 \$3.00 Ppd.**

120-PIECE "SAVE-THE-DAY" SPRING ASSORTMENT

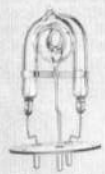
For hobbyists, homeowners, experimenters and maintenance men. How many times have you come up against a problem where a little spring would have saved a lot of frustration, time or expense? Here's the perfect answer. With this box of 120 small compression, extension and torsion springs of various sizes and tensions, you'll nearly always have the spring you need on hand. Thirty different springs, four of each kind. Not rejects, but first quality springs from a leading manufacturer. Weight 8 ounces.



No. 70,860 \$2.50 Postpaid

BUILD YOUR OWN PORTABLE AUTO ANALYZER FOR UNDER \$90.

Order the FT-118 Xenon-filled flashtube below and we'll send directions for building a timing light plus 8 other low-cost auto test instruments in one compact cabinet. You get complete directions as they appeared in Popular Science magazine. These G.E. flashtubes can also be used for electronic photo flash (strobe) units, signal lights, control devices, etc. FT-118, a standard for covered strobes, is well suited for use with electrolytic-type capacitors . . . 400-550 V operation. Crimps into reflectors, three pins serve as soldering terminals. Tube FT-30 is a low voltage (120 & 500) type for low energy repetitive flash applications, $\frac{25}{16}$ " long x $\frac{1}{4}$ " diam. Will make high quality low cost auto timing light. Directions included.



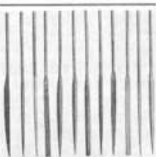
Flashtube FT-118. **No. 40,726 \$9.00 Ppd.**

Flashtube FT-30. **No. 40,725 \$5.20 Ppd.**

NEEDLE FILES

12 shapes (flat, round, taper, square, oval, diamond, wedge, etc.) Coarse to fine. Each $\frac{5}{16}$ " overall. For industry, gunsmiths and home shops. Plastic case.

No. P-30,113 \$4.00 Ppd.



NEW! COMPLETE AIR-BRUSH PAINT SPRAY KIT



Precision tool designed for fine spray painting of models and other small items, for touch up, etc. where delicate control is a must. For flat, glossy or metallic colors without brush marks; solid finishes, blending, shading or fogging. Use free hand or with stencils. Adjustable nozzle also permits full spray for auto, furniture or appliance touch up. Far superior to ordinary spray paint cans or ordinary spray guns. Easily mastered spray painting is a useful, interesting hobby.

Precision, thoroughly tested air brush complete with holder, 3 glass paint jars (one 1-oz., two $\frac{1}{2}$ -oz.), 6-ft. vinyl air hose, air regulator and control valve, two 15-oz. cans of Propel, tack cloth, 12 stirring rods and complete instructions.

No. 70,846 \$26.95 Ppd.

Can (15-oz. Propel only) **No. 60,588 \$2.50 Ppd.**

Adapter ($\frac{1}{4}$ ") for attaching hose to compressed air supply. **No. 40,932 \$1.20 Postpaid**

Economy Air-Brush Kit. Similar to above with air-brush, on-off valve, 1 oz. glass jar, 5' vinyl air hose, 1 can Propel, instructions. **No. 70,938 \$8.50 Ppd.**

Tire Adapter. Use spare tire as air supply for Nos. 70,846, 70,938. **No. 41,059 \$1.00 Postpaid**

EPOXY CEMENTS FOR ALL PURPOSES

SUPERSTRONG, EPOXY MOLECULAR CEMENT

Cements almost anything to anything with unbreakable bond . . . excellent for mounting lenses. No heat required. No pressure needed. Waterproof, won't shrink or expand. (Not for plastics.) One set (two $\frac{3}{4}$ -oz. tubes) mix equal amounts as needed. **No. 40,379 98¢ Ppd.**
One set (two 4-oz. cans) **No. 60,371 \$4.00 Ppd.**

TRANSPARENT EPOXY . . . CRYSTAL CLEAR

Similar to above in applications etc.; however, being transparent, it is perfect for cementing glass, jewelry, gems & minerals, marble, pottery, ceramics & plastics. One Set (two $\frac{3}{4}$ -oz. tubes). **No. 40,674 98¢ Ppd.**
One Set (two 4-oz. cans). **No. 60,372 \$4.00 Ppd.**

PUTTY-LIKE EPOXY HARDENS LIKE STEEL

In new putty like sticks. The simplest to use, best cement yet for home and workshop. Repairs automobiles, fiberglass boats, furniture, brick and concrete, plumbing. Sets in approx. 1½ hrs. Won't sag, run or drip. Unaffected by temperatures up to 200°F. Instructions, resin and hardener. **No. 60,551 Only 98¢ Ppd.**

NEW SPRAY EPOXY ADHESIVE

Press nozzle to coat surfaces with this one part, all purpose, epoxy adhesive. No heating or mixing required. Bonds metal, glass, wood, ceramics and many other materials. Drying time approx. 10 minutes, cures within 8 to 16 hours at room temperature. 6 oz. (net) aerosol can covers 1000-2000 square inches depending on porosity of surface. **No. 60,623 \$2.25 Ppd.**

EPOXY HEAT SEAL BEATS SOLDER, GLUE

Seal small breaks, holes, or punctures in all metals plus ceramics and glass. Patch withstands pressures up to 250 psi, temperatures to 350°F! Nothing to prepare or mix . . . merely heat punctured or broken part to 400°F, using butane (low-cost), propane or acetylene torch, apply epoxy-resin stick which cures and seals as it melts. Patch stiffens in 30 seconds. Seals Freon 12 and 22, ammonia, SO₂, air, water, steam, gas or oil systems. $\frac{4}{16}$ " x $\frac{3}{8}$ " stick. **No. 40,890 \$2.50 Postpaid**

PROTECT YOUR FAMILY AND PROPERTY AGAINST FIRE AND BURGLARY

This page lists a series of carefully selected personal, home and business protective devices. They are inexpensive, of excellent quality and are easy to install and maintain. Buy the protection you need now . . . tomorrow may be too late. It's a relief to know you are protected.



STOP INTRUDERS WITH DOOR OR WINDOW ALARM

For your home,
garage, trailer
business
premises, etc.

Installs in seconds. Protect your premises against entry. Spring contact wired to alarm is concealed between window and sill or door and frame. Opening of window or door sets off loud blast. Operates on one large (D) flashlight battery (not incl.). Housed in white and gold metal case, 1 1/2" deep x 2 1/2" wide x 5 1/4" high. Supplied complete with switch, insulator, 6-foot cord and installation instructions.

No. 60,329 \$4.00 Ppd.

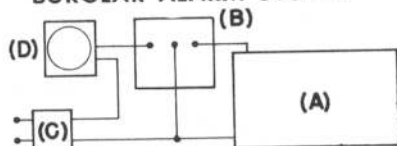
NEW FIRE ALARM POWERED BY NI-CD BATTERIES

Sleep secure . . . if room temperature should reach 126-140° F. due to fire, alarm sounds extra loud horn. Never needs batteries. Works even when electricity fails; because when plugged in, its nickel cadmium batteries are constantly charging. White plastic case 1 1/2" x 3" x 3 1/2" with test button, 6' cord. **No. 70,848 \$9.95 Ppd.**



Standard "D" Battery Fire Alarm. Mounts on wall, sounds loud horn when room temp. reaches 145 to 165° F. Operates on 1 "D" flashlight cell (not incl.) 1 1/2" deep x 2 3/4" wide x 5 1/2" high. **No. 60,314 \$4.95 Ppd.**
4 or more (please specify). **Only \$4.00 Ea. Ppd.**

BURGLAR ALARM SYSTEM



(A) Signaling Mat. Actuated by less than 5 lbs. pressure at any point. Ideal for concealment under rugs, etc. Switching elements electronically sealed between sheets of tough vinyl. Use near safes, in doorways, etc., 8-12 volt operation, 3/32" thick x 17" wide x 23" long. 6-ft. leads included. **No. 70,588 \$8.50 Postpaid**

(B) Constant Ringing Drop Relay. Obtain locally.
(C) Transformer. Reduces house voltage to level needed by circuit diagrammed. Input 110-120 volt, AC; 60 cycles. Output at 115 volts: 11 volts AC with light load, 10 volts AC at 1 amp., 9.5 volts AC at 2 amps. **No. 60,258 \$2.25 Postpaid**

(D) Bell. Obtain locally, heavy duty 12V AC type.

SURPLUS NICKEL-CADMIUM BATTERIES

Excellent to power burglar and fire alarm systems. Each cell is rated at 1.25 Volt D.C. Couple cells together to build the battery voltage required. Easily charged, hermetically sealed, leak resistant. These batteries have excellent charge retention qualities. See listings for batteries and Charger Kit on pages 13 and 52.



STANDBY EMERGENCY LIGHT

Does 2 valuable jobs in the home. Keep plugged into socket. If power fails, it goes on automatically. Use as rechargeable flashlight too.

No. 60,276 \$9.95 Ppd.



PROXIMITY SWITCH

For window alarms. Switch mounted on frame responds to moving magnet mounted on sash. Switch and magnet both included. Rating: 15 watts resistive maximum up to 1 amp.; up to 250V AC. **No. 40,586 \$1.98 Postpaid**

ALARM HELPS GET YOU HOME SAFELY

For your personal protection and safety in darkened streets and subways. Fits hand or bag. Emits loud piercing alarm and continues to blast even if pulled from hand and thrown to ground. Only you can stop it. Frightens would-be attackers, summons help fast. Gold and black metal. Operates on 1 "C" battery (not incl.); 1" thick x 1 1/2" wide x 4 1/4" high. With instructions.



No. 60,330 \$3.00 Postpaid



OBSERV-O-SCOPE

Observe callers without being seen. Easily mounts in door and gives wide field (175°) of vision for extra protection. Spot callers in front or to both sides of door, even crouched below. Unobtrusive, visible outside diameter only 3/16". Excellent optical quality for clear sharp image.

Door Thickness

3/4 to 2 1/4" **No. 40,582 \$3.30 Postpaid**
Less than 3/4" use above, cut to fit
and use **Adapter No. 40,584 70¢ Ppd.**
1 7/8 to 2 1/2" **No. 40,583 \$3.30 Postpaid**
Up to 3" Use **No. 40,583 and Adapter No. 40,585 \$1.50 Ppd.**

LEAVE A LIGHT

Electronic eye automatically turns house lights on at dusk and off at dawn. Discourages burglars and prevents accidents — you always come home to a lighted house. Attractive white and gold plastic case mounts on wall or window frame. Plug into nearby outlet, plug one or more lights into it (up to 300 watts) and forget it. 1 1/8" x 2 3/4" x 2 3/4"; 5 ft. cord. **No. 70,871 \$5.95 Ppd.**



OTHER PROTECTIVE AND HELPFUL DEVICES

Chemical Light Kit	page 147
Two Sided Adhesive Tape	page 58
Black Light Chalk, Paper, Paint	page 99
Keyhole Light with Lifetime Battery	page 60
Pocket Size Hand Warmer	page 58
Safety Goggles, Impact Resistant	page 46
Throw Away Polyethylene Gloves	page 55
Executive Tranquilizer	page 9
Electric Engraver Protects Objects and Belongings	page 47
Space Age Blankets	page 5
Eye-glass Wearer's Kit	page 58
High Speed Thermometer	page 57
Solar Cigarette Lighter	page 30
Variable-Density Filters	page 2

Sale! NEW, SURPLUS, NICKEL-CADMIUM BATTERIES

SAVE 50% . . . MAKE EXCELLENT REPLACEMENTS



No. 40,987



No. 40,986

These Nickel-Cadmium Cells and Batteries are NEW AND UNUSED. Manufactured to a customer's order, an unexpected design change caused cancellation. Edmund Scientific Co. bought a large quantity and passes the BARGAIN PRICES on to you. SAVINGS OF 50% can be immediately realized. Buy while stocks are available.

Cells are HERMETICALLY SEALED IN STEEL CASES to eliminate gassing. NO MAINTENANCE required. LEAK RESISTANT, they operate in any position, have a LONG ACTIVE LIFE, and an INDEFINITE STORAGE LIFE. They will accept, at least 300 CHARGE AND DISCHARGE CYCLES providing recommended charge rate of 75 ma. 16 hours is maintained. Each cell is rated at 1.25 Volts, 750 ma. hrs. capacity, and is supplied complete with two welded (for soldering connections) tabs and composition jacket. Measures $\frac{7}{8}$ " diam. x $1\frac{1}{2}$ " high. Wt. approx. $1\frac{1}{2}$ oz. each. They have dozens of applications and uses including:

- | | |
|---------------------------|--------------------------|
| (1) Electronic Photoflash | (7) Transistor Radios |
| (2) Dictating Machines | (8) Small Receivers |
| (3) Flashlights | (9) Movie Cameras |
| (4) Tape Recorders | (10) Model Boats, Planes |
| (5) Small Appliances | (11) Miniature Motors |
| (6) Alarm Systems | (12) Telemetering Equip. |
- Hobbyists, photographers, campers, service men, laboratory and research personnel will appreciate their long life and constant potential during discharge. They have excellent charge retention properties and will deliver almost 100% output at below freezing temperatures. Use as replacements in cordless knives, toothbrushes, etc.



No. 60,634



No. 60,333

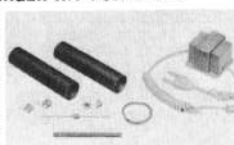
Unaffected by long standing in charged or discharged condition, these batteries are more than competitive with other types in terms of cost per hour of use. As pictured, the two, three, and four cell groups are connected together in series. Cells separate easily, just cut connectors.

Stock No.	Number of Cells	D.C. Voltages	Ma. Hrs.	Ppd. Price
40,986	1	1.25	750	\$1.50
40,987	2	2.50	750	2.75
60,633	3	3.75	750	3.60
60,634	4	5.00	750	4.80

Special prices on quantities of 100 or more. Write for quotation. A 6.25 volt battery can easily be assembled by connecting either No. 60,634 with No. 40,986 or No. 60,633 with No. 40,987.

CONVERSION AND CHARGER KIT FOR ABOVE

Save money with this convenient and economical unit. Complete kit converts four Ni-Cd batteries (listed above) into two double units; each equivalent to two "C-size" batteries. Kit includes all necessary charging equipment. It's so easy to plug into a home electrical outlet and keep your batteries "topped-up" for instant use. Included are 2 adapter sleeves (each holds two Ni-Cd batteries); 2 acorn connector-nuts; 12" insulated wire; 6" insulated tubing; 1 diode rectifier; 2 subminiature phone-jacks; 110 volt AC, 60 cycle, step-down transformer (3-volt AC output) and complete assembly-recharging instructions. Complete kit.



No. 60,651 \$4.25 Postpaid

Kit as above, but without transformer.

No. 60,643 \$1.75 Postpaid

Step-down transformer (110 volt AC, 60 cycles to 3 volts AC)

No. 60,379 \$2.50 Postpaid

See Large Capacity Vented Nickel-Cadmium Cells listed on page 13.

"TRICKLE" CHARGER FOR 1-10 NI-CD CELLS



Recharges 1 to 10 Ni-Cd cells (1.2 to 12 V.) at any rate from 10 to 250 milliamperes. Excellent for above and other semi-vented cells. Bakelite case 2" wide x $3\frac{3}{4}$ " high x $6\frac{1}{4}$ " long; wt. 3 lbs. Pilot light, 5-ft. cord, instructions.

No. 70,812 \$10.95 Ppd.



ROTARY SWITCH . . . 15 AMP.

Ideal 3-position switch for projectors. Wire to control room light, blower and projector light in order—with one switch. Performs in reverse. Handles 1 HP motor load. A \$6.00 value.

No. 40,635 \$1.50 Ppd.



BUILD YOUR OWN TRANSISTORIZED CLOCK

Transistorized clock movement operates for months on just one flashlight battery. Build your own clock in any type case, update any clock

with this fine kit. Can also be used to power instruments. Jeweled bearings reduce friction and give movement extra long life—balance wheel runs in V-type jewels; escape wheel pivots in hole jewel. Uses "C" size flashlight battery (not incl.). Complete with fit-up nut, washers and two sets of hands—modern gold with $2\frac{3}{4}$ " minute hand; ornate black with $3\frac{3}{4}$ " minute hand. Overall $\frac{7}{8}$ " deep x $2\frac{3}{4}$ " wide x $3\frac{3}{8}$ " high. American made.

No. 60,516 \$9.50 Postpaid



3400 RPM ELECTRIC MOTOR

Drive fans, models with this shaded pole, induction, 110 volt A.C., surplus motor. Sintered bronze, self-aligning bearings; drilled metal mount; $\frac{3}{4}$ " x $\frac{3}{4}$ " shaft, threaded 10-32. Wt. 1 lb. 4 oz. C. C. rotation.

No. 60,625 \$2.50 Postpaid

NEW SOLAR DRIVE MOTOR**Power Models, etc. by Sunlight**

Attach to Silicon Cell No. 30,538 (page 31) and it runs by sunlight alone. Or use a standard flashlight cell, or one Ni-Cd Cell (See listings on pages 13 and 52). Use where application necessitates motor recommendation.

ed by International Rectifier. Where possible, use higher efficiency motor No. 40,902 listed on page 54.

Has self-aligning bronze bearings. Operates on 0.35 to 1.5V. Shaft .078" in diameter extends $\frac{3}{16}$ "; has $\frac{3}{16}$ " diameter V-groove pulley. Spring bronze brushes. Metal and plastic housing $\frac{1}{8}$ " x $1\frac{1}{2}$ " diameter. Wt. 2 oz.

No. 40,872 \$3.95 Postpaid

AUTOTRANSFORMER

Surplus bargain for step down use. 120-V, 60-C AC input. Output 21-V, 60-C AC at 7 amperes. Excellent for powering 28-V Mazda lamps (pg. 101) and Col-



limators-Parallel Light Sources (pg. 95). Unlike regular transformers, it has only one winding, common to both high and low voltage connections. Mfd. by Sylvania Electric. Color coded leads. $2\frac{1}{4}$ " high x $2\frac{3}{8}$ " long on $3\frac{1}{2}$ "-long mounting flange. Instructions included.

No. 60,582 \$2.95 Ppd.

**STEPPDOWN TRANSFORMER**

An excellent item for manufacturers and hobbyists alike. Has many medium current applications. Input 110 to 120 volt AC, 60 cycles. Output at 115 volts: 11 volts AC with light

load, 10 volts AC at 1 amp., 9.5 volts AC at 2 amps. Overall size $1\frac{1}{2}$ " wide x 2" high x $3\frac{1}{4}$ " long. Wt. 13 oz.

No. 60,258 Each \$2.25 Postpaid

LOW-COST MERCURY TILT-SWITCH . . . FEATHER-TOUCH OPERATION

You can use this tiny, silent and practically indestructible tilt switch to make and break circuits of regular house electricity or small flashlight batteries. Only a 20° angular movement is required. Simply support it on a pivot. Hermetically sealed, and filled with arc-suppressing gas, its resistance will not vary during service. Copper-flashed, metal capsule ($\frac{5}{16}$ " x $\frac{1}{2}$ " body diam.) is one electrical terminal; rod ($\frac{1}{2}$ " x .040" diam.) is second. Weighs only 1.9 grams. For 120-V, AC or 1.5V DC. Will carry 2 amps at 120V. Application sheet incl.

No. P-40,710 (Pkg. of 3) \$1.25 Ppd.

No. P-40,713 (Pkg. of 10) \$3.75 Ppd.

No. P-60,434 (Pkg. of 100) \$30.00 Ppd.

**HEAVY-DUTY SOLAR TIME SWITCH SAVES ELECTRICITY**

Bargain-priced Swiss mechanism driven by a 2.7-watt synchronous motor can be used to control yard lights, holiday lights, sign illumination, chicken house lights, etc. Will turn lights on at dusk and off at dawn, on at dusk and off at midnight, or on at midnight and off at dawn. Automatically adjusts for varying lengths of days; dawn and dusk times throughout a range of $1\frac{1}{2}$ hours; midnight

time through 2 hours. Police advise protective lighting for the home to discourage burglars. This excellent control handles several such lights. Heavy-duty contacts take light loads to 1200 watts, motor loads (inductive) to 10 amps. With clear plastic case $3\frac{3}{4}$ " diam. x $6\frac{1}{4}$ " high. Removed from street lights. . . original cost over \$60.00. Instructions included. Used, but in good condition.

No. 60,328 \$9.00 Postpaid

**PHOTO-CONDUCTOR FUN**

Build light actuated electronic circuits for a wide variety of impressive and practical applications. Make a photo-electric counter for entranceways or conveyor belts, construct a headlight actuated garage door opener or a game room target shoot. Spend enjoyable hours experimenting with one of the electronic industries' most fascinating developments. Photoconductor kit includes 52-page booklet explaining in clear detail how to construct 19 different projects such as: annunciators, automatic volume controls, lightmeters, tachometers and many more. But use your own imagination . . . there's no limit to the projects you can cook up. Parts include: 3 T-4 CdS photoconductors ($\frac{1}{2}$ " in diam. x $\frac{1}{2}$ " long); a mounting bracket; a Sigma AC-DC relay (2 amps resistive load) and a 22K-Ohm, 1-watt resistor.

No. 60,441 \$10.45 Postage included

FOR RUNNING SMALL MOTORS

Battery Holder with Clips and Rheostat. Used by the Army for illuminating optical instruments. Operates from two standard flashlight batteries (not included) and has a rheostat to vary illumination or speed. Has clips for attaching to small motors, etc. Sturdily made of brass. Gov't. cost \$15.00.

No. 60,202 \$2.50 Ppd.

See Page 98 for Grain of Wheat Bulb and Sockets.

HEAT LIQUIDS ANYWHERE . . . INSTANTLY

Pocket-sized heater plugs into household socket, brings liquids to boil in 1 minute. 110 volts, 250 watts.

No. 60,107 \$1.00 Ppd.

SURPLUS TELEPHONE GENERATOR BUILT FOR SIGNAL CORPS FOR \$15.00 . . . OUR PRICE \$6.95

This brand-new war surplus generator, originally intended for use in a field telephone, opens up unlimited possibilities for experiment. Cost only \$6.95 while they last. Just by turning crank you generate over 100 V.

It can be used for classroom experiments, to demonstrate uses of electricity, to ring a telephone bell. One reported use is to charge the ground and bring night crawlers up for fishing bait. You can disassemble it to get two Alnico permanent magnets ($3\frac{1}{8}$ " x $\frac{3}{16}$ " x 2"), gears, clutch, etc. Size of generator is $3\frac{1}{8}$ " high x $4\frac{1}{8}$ " long. Suggested experiments included.

Generator shipped may be somewhat different in appearance to that illustrated, but it will function identically.

No. 50,225 \$6.95 Postpaid

Same generator mounted on board with light to demonstrate electricity. **No. 50,365 \$11.95 Postpaid**

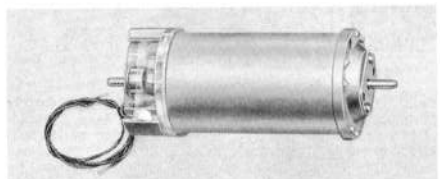
VARI-VOLT FOR CONTROL OF LIGHTS & POWER TOOLS

Provides completely variable speed control from zero to full capacity of universal electric motors up to $\frac{1}{2}$ H.P. Allows infinite control of varying brightness of incandescent light up to 1,000 watts and heating temperatures. Has many uses in light industrial and home workshop applications, stages, auditoriums, photo studios. Fuse protected and equipped with standard 3-prong, grounding type receptacle and plug . . . assures safe operation of portable power tools. For 110 volt, 7 amp. Heavy-duty plastic body is 2" x $3\frac{3}{4}$ " x $6\frac{1}{4}$ ", 68" cord.

No. 70,666 \$19.95 Ppd.



MOTORS & PUMPS



IMPROVED, MINIATURE, BALL-BEARING MOTOR LONG LIFE—MORE POWER WITH LESS CURRENT

Use this smooth running 1½ to 3-volt DC motor for development or experimental work, for hobby projects, models, displays, etc. Built to Edmund's exact specifications by European craftsmen. Highest efficiency and long life achieved through sintered, graphite-copper brushes which minimize frictional drag on commutator, ball bearings, and a unique "inside-out" design with the field magnets placed within armature coils.

Tops for use with solar cells, especially No. 30,538 (page 31). Current usage very small . . . operates 50 hours on 2 "D" flashlight batteries. Our Nickel-Cadmium, rechargeable cell (pg. 13, 52) powers it for over 1 week. Metal housing, 2¼" x 1", has one transparent plastic end. Shaft, .083" in diam., extends ¼" from each end. Wt. only 2½ oz.

No. 40,902 \$3.95 Ppd.

Estimated Govt. cost approx. \$70.00 per pair. Make antenna position indicators, remote reading wind direction indicators, and many other remote control devices.

Connected together, and to 115-V, 60-C AC line, any motion given shaft of one unit is transmitted instantly to other. Torque sufficient to position indicating devices, actuate switches or move

light loads. By rewiring, one unit will rotate in an opposite direction from the other, or 180° out of step. Cases are solid bronze. Shafts rotate in ball bearings. Each 7" x 4½" diam. unit weighs 8 lbs. With 45" insulated wires. Shafts ¼" diam. x 1½" long have ¼"-28 thread ¾" long.

No. 70,724 Pair \$30.00 Ppd.

Differential Selsyn with Stop Assembly. Estimated Govt. cost approx. \$33.00 each. Use to make corrections in Selsyn systems. Use between Selsyn units above to indicate the sum or difference of rotor motions (instructions incl.). Or use as transmitter or receiver in limited action remote control or indicating systems. Has 3-phase, 115-V windings and must be used with Selsyns above. Rated for continuous duty. Iron and aluminum housing, ball bearing mounted shafts. Exposed shaft ¾" diam. x 7/8" long. 5¼" long x 3½" in diam. overall. Wt. 4½ lbs. Rotation 14° (limited).

No. 70,735 \$4.50 Postpaid

Special prices on lots of 100 and 1,000. Write today.

"U.S. Navy Synchron . . ." By Bureau of Ordinance. 104 pages.

No. 9364 Only 70c Ppd.



MINIATURE DC MOTORS

New IMPROVED model No. 30,305 . . . double life of former model.

These mighty little motors operate on two standard flashlight cells and are excellent for toys, models, etc. Shaft rotations can be changed by switching connection of two lead wires. Strong permanent magnetic fields. Holes in bases for easy mounting.

(A) 7/8" high x 1¼" x 1½". Shaft diam. .080", length ¾". Wt. .7 oz. **No. 30,305 Only \$1.00 Ppd.**
(B) More powerful than above. 5000 R.P.M. at 3.0V. 1¾" high x 1¾". Shaft diam. .090", length ¾". Wt. 2 oz. **No. 60,613 \$1.50 Ppd.**

MINIATURE PUMP

7½ GALLONS

PER HOUR

OPERATED FROM

TWO FLASHLIGHT

BATTERIES



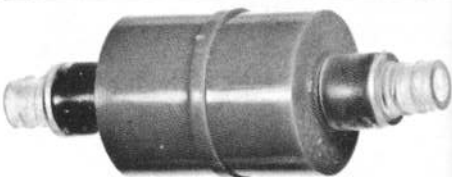
- Perfect for the photo darkroom
- Ideal for table fountains, waterfalls, etc.
- Operates on 1 or 2 flashlight batteries

This miniature (1¼" x 2½") electric motor and pump is ideal for schools and club experiments. A great boon to the photo darkroom and particularly important in color development. Base of pump is placed in liquid. Pumps a continuous flow up to 1 pint per minute through tube 12" high (4" tube included). Can be used in either direction. Impeller is more efficient when rotating counter clockwise. Self priming. With 2 flashlight batteries in series, it will pump liquids to a height of 24" (not a 24" high stream). Runs for 48 hours on one battery. Not convertible to AC-DC.

Can be used in many ways including: circulation of darkroom chemicals, table fountains and displays, model waterfalls, hydroelectric installation, canal locks, water filtration and aeration for fish tanks, flow models of circulatory systems, automatic plant watering units, humidifiers, etc.

No. 50,345 \$2.25 Postpaid

Battery Holder. Ideal for use with above. See page 53.

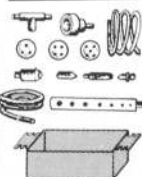


BEST SUBMERSIBLE PUMP WE'VE TESTED

- Operates UNDER WATER on 8 to 20-volts AC
- LIFTS 1 PINT PER MINUTE at 12" head (on 20V)
- With recommended ¾" nozzle, PUMPS FOUNTAIN-LIKE STREAM OVER 30" HIGH (on 20V)

This electro-magnetic, reciprocating pump is excellent for science classes, student projects, exhibits, miniature waterfalls and fountains. Sturdily built for long, trouble-free operation. Operates at peak efficiency with low-cost bell or train transformer (not included). Plastic case 2½" long x 1" diameter. Complete with spare valve, spring and instructions. Imported. Weight only 1¼ oz. (Not recommended for use in salt water.)

No. 60,307 Only \$2.98 Ppd.

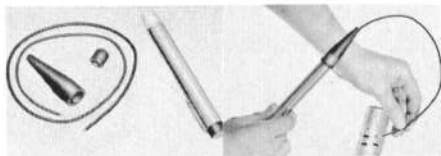


PUMP ACCESSORY KIT

Supplies most of the accessories needed to adapt Pumps No. 60,307 and No. 50,345 for various projects. Kit includes rectangular water container, (holds approx. 1½ pints), hose couplings, tees, jet nozzles, 6½ ft. (¼" I.D.) and approx. 2 ft. (¼" O.D.) clear plastic tubing.

No. 70,936 \$2.98 Postpaid

See Other Pumps Listed on Page 8.

**FLEXILIGHT ILLUMINATES INACCESSIBLE AREAS**

"Pipe" light into inaccessible places. Two foot long, flexible plastic light guide snakes in and around corners, through small holes, lights areas hidden in shadows and unlit by regular flashlights. A must for TV, radio and appliance repairmen; electricians; mechanics; hobbyists; etc. Light, from the penlight, travels along the 2 foot length of vinyl cased, 64 plastic fiber light guide to any point where the end is aimed. Light guide measures .130" O.D., minimum bending radius $\frac{3}{4}$ ", has .004 sq. in. of light surface. Unit includes chrome finish $\frac{5}{16}$ " long x $\frac{5}{8}$ " diam. rotary switch penlight, bulb, rubber centering guide (for fiber light guide), rubber adapter and complete instructions. Batteries not included. Weighs 5 oz. Flexilight is easily converted to a regular penlight by removing the adapter.

No. 60,648 \$2.75 Ppd.**SURPLUS, SELF-CONTAINED PHOTOCELL RELAY SYSTEM**

Easily adapted to operate burglar alarms; counters for people, cars or conveyor packages; annunciators; smoke alarms to control air pollution; garage door openers; streetlight controls; various warning systems; assembly-line controls; bin-level measurers, etc. Manufacturer's surplus, these photocell relay systems were built for expensive copying machines. Unit includes cadmium sulfide photocell, single-pole double-throw relay, silicon rectifier, capacitor, resistor, 6.5-volt lamp, and 75-watt 125-volt socket (U.L. approved). Operates on 110-volt AC. Housed in $1\frac{1}{2}$ " x $3\frac{3}{8}$ " x $3\frac{3}{4}$ " metal case (exclusive of 2 mounting flanges). Weighs 11 $\frac{1}{2}$ oz. Instructions for most applications included.

No. 60,662 \$3.00 Ppd.**SURPLUS, HIGH-SPEED, UNIVERSAL AC-DC MOTOR**

Approx. 17,000 R.P.M.
no-load speed



These used surplus 115-volt, high-speed motors make excellent tool-post or bench grinders and polishers (metal, plastic, wood). Counter-clockwise rotation. Have sleeve type oilless bearings, built-in cooling fan. Shaft, $\frac{3}{16}$ " diam. x $1\frac{3}{4}$ " long, includes 1" worm thread. Motor housing measures $2\frac{3}{16}$ " x $2\frac{1}{4}$ " wide x $3\frac{1}{8}$ " long. Includes clockwise rotation instructions.

No. 60,653 \$4.00 Postpaid**MICROSWITCHES ... JUST TOUCH TO OPERATE**

These new microswitches function at very light pressures. Typical applications include limit switches (garage doors), package counters, burglar alarms, etc. Rated for 5 amp. at 125-volt AC and for 3 amp. at 250-volt AC. U.L. inspected.

Single-pole, double-throw Pkg. of 2 No. 40,993 \$1.25 Ppd.
Single-pole, single-throw Pkg. of 2 No. 40,994 \$1.00 Ppd.

**SURPLUS PUSH-BUTTON SWITCHES**

Same type as used in closets, refrigerators, automobiles, etc. Open door and light or fan switches on. Momentary contact, single-pole single-throw type. Capacity .75 amp. at 125 volts, .25 amp. at 250 volts. Measures $\frac{3}{4}$ " diam., $2\frac{3}{16}$ " overall. Plunger, $2\frac{3}{32}$ " long, travels approx. $\frac{3}{8}$ ". Unit mounts in $\frac{3}{8}$ " hole. Lock nut incl. Package of four.

No. P-41,060 \$1.00 Postpaid

CONVERT SOLAR ENERGY INTO ELECTRICITY
See Selenium and Silicon Solar Cells also
Solar Conversion Unit on page 31.

CONVERT HEAT DIRECTLY INTO ELECTRICITY
See Thermo-electric Generator, No. 70,436,
described on page 29.

DISPOSABLE ITEMS**PROTECTIVE, ZIP-LIP POLY BAGS**

Ingenious snap seal runs full width of heavy duty, 4-mil bag. Seals, opens, and reseals indefinitely.

4"x4" size.
Pkg. of 10. No. P-40,681 \$1.25 Ppd.
Pkg. of 100. No. P-60,395 \$10.00 Ppd.
9"x12" size.
Pkg. of 5. No. P-70,684 \$1.00 Ppd.
Pkg. of 100. No. P-70,690 \$17.00 Ppd.

DISPOSABLE PLASTIC MIXING AND MEASURING CUPS

Less expensive than paper and much more convenient to use. 1-oz. size costs only $1\frac{1}{2}$ ¢. Crystal clear polystyrene for instant check on color and transparency of contents. Clearly marked for accurate measuring. 1-oz. size marked in cu.cms, ml, teaspoons, tablespoons, oz. & drams, has smooth beaded lip ... base diam. $1\frac{1}{8}$ ", height $1\frac{1}{2}$ ". 6-oz. size marked in cc's, ml's, designed to prevent tipping and has non-spill pouring lip ... base diam. $1\frac{7}{8}$ ", height $3\frac{3}{8}$ ".



1-oz. Size. Pkg. of 100. No. P-60,365 \$1.50 Ppd.
1-oz. Size. Pkg. of 400. No. P-70,624 5.00 Ppd.
6-oz. Size. Pkg. of 20. No. P-60,364 1.60 Ppd.
6-oz. Size. Pkg. of 100. No. P-70,625 7.00 Ppd.

THROW-AWAY POLYETHYLENE GLOVES

For just a few pennies, these soft, light-weight, polyethylene gloves protect hands from harmful or dirty substances. They resist solvents, chemicals, detergents and are waterproof. Useful for laboratories, shops, hospitals, mechanics, painters, even for washing the family car. **Buy 100 and save.**



Package of 100 { No. P-60,317 Medium \$2.95 Postpaid
 { No. P-60,321 Large 2.95 Postpaid
Package of 24 { No. P-60,316 Medium 1.00 Postpaid
 { No. P-60,320 Large 1.00 Postpaid

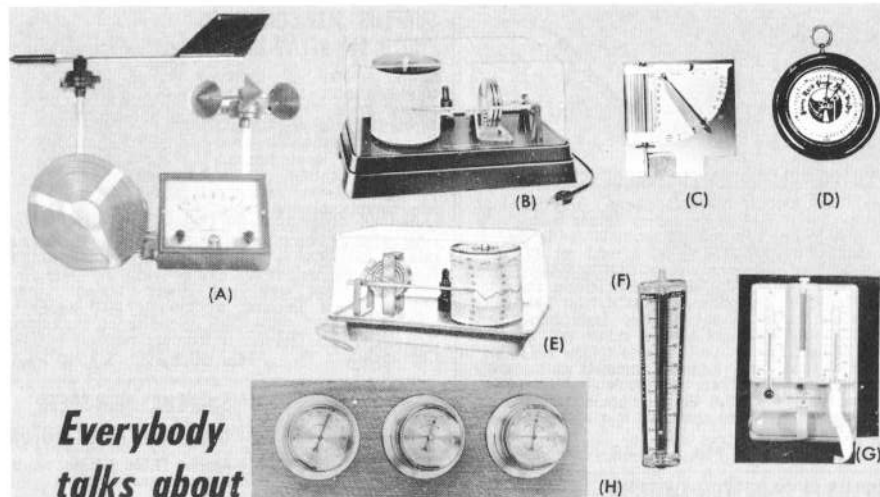
Seamless Vinyl. More durable, provide improved finger sensitivity and hand dexterity.

Pkg. 10. No. P-60,496 Medium Large \$ 1.50 Ppd.
Pkg. 100. No. P-70,715 Medium Large \$12.25 Ppd.

THROW-AWAY RAZOR BLADE KNIVES

So low cost you throw away when dull. Eliminates cuts from changing knife blades, or handling razors. Sharp single edge blade in handle is ideal for industrial and hobby use. Save time, trouble and money. Buy in lots of 100. Length 5", blade 2" long.

No. P-40,425 Package of 10 50¢ Postpaid
No. P-70,369 Package of 50 \$2.50 Postpaid
No. P-70,372 Package of 100 \$4.00 Postpaid



**Everybody
talks about**

the weather—Why not be really well informed?

These handsome, precision weather instruments are a pleasure to own and use. They keep you abreast of all important weather conditions affecting your daily life. Recording, studying and being "weather wise" is an

extremely interesting hobby. Start forecasting today. Weather instruments make outstanding gifts at Christmas, Birthday, Father's Day & special occasions.

(A) WIND SPEED AND DIRECTION INDICATOR

Professional unit for the home, office, yacht, gun or golf club, landing fields, farms. Mounts on roof, flagpole, etc., like TV antenna. Necessary supports and brackets (not supplied) can easily be obtained from TV store. Read wind speed and direction on one dial. Two wind velocity scales for greater accuracy. 0-25 and 0-100 MPH. No outside power source needed. Attractive mahogany-finished indicator, 6 $\frac{3}{8}$ x 5 $\frac{1}{2}$ ", mounts conveniently indoors. Transmitting unit (app. 24" high) can be as far away as 2,000 ft. Outdoor parts are corrosion resistant. With D-size battery, 60-ft. cable, instructions. Weight 8 $\frac{1}{2}$ lbs.

No. 70,310 \$119.50 Postpaid

(B) RECORDING BAROMETER

A breakthrough in movement design. Combines magnified pointer motion and universal altitude range. Pen motion increased 50% making readily apparent small pressure changes on the chart.

Responds at once to pressure change with practically no observable lag when pen motion reverses. Range: 29" to 31" of mercury; altitude sea level to 10,000 feet. Chart drum has 110V, 60 cycle clock drive. Mounted on black plastic base . . . removable clear plastic cover. Measures 13" long, 6 $\frac{1}{2}$ " high, 6 $\frac{3}{4}$ " deep. Weight 4 lbs. 15 oz. 12 color-banded charts, ink and instructions included.

No. 70,600 \$60.00 Ppd.

Recording Charts. Pkg. of 52. **No. P-90,044 \$5.00 Ppd.**

(C) PERSONAL RAIN AND WEATHER GAGE

Shows wind direction and speed, registers temperature and records rainfall for the week, month and year. Sturdy white plastic, 5" x 6".

No. 50,259 \$2.00 Ppd.

(D) WALL TYPE BAROMETER

Attractive functional and decorative piece for any room in your home. An accurate, sensitive aneroid barometer. Mahogany finished hardwood case. Enameled two-tone dial, polished brass indicator 5"-diam. face. Precision made in West Germany. Temperature and humidity switch plate included.

No. 50,008 \$7.50 Postpaid

(E) RECORDING THERMOMETER

Same size as barometer (B). Records outdoor temperatures on an indoor chart, keeps a permanent record of hour by hour temperature variations. Electric drive . . . uses household current (115V), 7-day chart, minus 40° to 120° F. Colored bands indicate temperature zones. With 13 charts, ink, and instructions. Eight foot capillary tubing. Wt. 6 lbs.

No. 70,312 \$60.00 Ppd.

Recording Charts. Pkg. of 52. **No. P-90,045 \$5.00 Ppd.**

(F) HOW FAST IS THE WIND BLOWING?

Pocket wind meter. Tells you wind speed in seconds. Reads to nearest MPH. Two scales, one graduated 2-10 MPH in $\frac{1}{2}$ MPH increments; the other from 10-66 MPH in 2 MPH increments. Easily read, 6 $\frac{3}{8}$ " long x 1 $\frac{1}{2}$ " high x $\frac{3}{8}$ " thick. Weighs approx. 2 oz. Case and instructions included.

No. 60,349 \$5.95 Ppd.

(G) DISCOMFORT METER (Hygrometer)

For wall, table or desk. Matched wet and dry bulb thermometers determine Temperature-Humidity Index. In brown, plastic case, 3 $\frac{3}{4}$ x 5 $\frac{1}{2}$ ", with glass waterholder, spare wick, instructions.

No. 50,352 \$12.50 Ppd.

(H) COMPLETE HOME WEATHER STATION

Three accurate, dial-type instruments (barometer, thermometer and hygrometer) help accurately forecast weather. Thermometer has bi-metal movement accurate to $\pm 2\%$; barometer movement is engineered by Wilhelm Huger; hygrometer calibrated 10% to 100% relative humidity. Dials of finely-etched aluminum. The three units are fastened to panel for wall or desk mounting. Unit dials rotate 90° for vertical wall mounting. Units have simulated polished brass finish. Measures 7 $\frac{1}{2}$ " deep x 5 $\frac{3}{4}$ " wide x 15 $\frac{1}{2}$ " long. Wt. approx. 1 lb. Three supports for desk display, and Inst. Hygrometer accurate to $\pm 5\%$; barometer to $\pm .25$ ".

No. 70,607 \$9.95 Ppd.

SEE SOLAR FURNACES, SOLAR CELLS, SOLAR
CIGARETTE LIGHTERS, BURNING GLASSES,
RADIOMETERS, LISTED & DESCRIBED ON PGS. 30-31

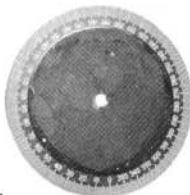
MISCELLANEOUS

- RANGEFINDER
- SPLIT IMAGE TRANSIT
- TUNING FORKS
- STOPWATCHES

GRADUATED 360° SCALE ... 4" DIAM.

Great for instrument builders. Black bakelite circle graduated 360°. Small white lines mark every 1°, longer lines mark every 5°, numbered every 10°. Numbers progress clockwise. 1/4" diam. pivot hole.

No. 40,335 \$1.00 Ppd.



F° & C°, WIDE-RANGE THERMOMETER

This durable thermometer filled with red liquid has stainless steel body etched and filled in black. Marked every 5° from -20° to +220° F. and every 2° from -20° to +100° C. . . . numerical values every 10° on both scales. Glass tube, 4" long, calibrated at 70° and 150° F., is mounted with stainless bands and waterproof cement. With mounting hole. Size 5 1/4" x 5/8".

No. 60,504 \$1.00 Ppd.
Pkg. of 6. No. P-40,775 \$5.00 Ppd.

COMBINATION PEDOMETER AND COMPASS

Attach to your belt. Learn how many miles you walk each day, week, month and your yearly average. Check your position with the magnetic compass on the opposite side. A valuable item for all campers, hikers, sportsmen, scouts, etc. Even housewives like to know how much distance they cover. Pedometer has large 1 1/2" diam. with a convenient external adjustment to set to the length of your stride. Chromium-plated case with belt-clip and chain ring.

No. 41,000 \$8.50 Ppd.



INEXPENSIVE MAGNETIC COMPASSES

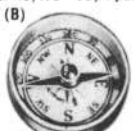


(A) 45mm diam. Comes in a highly polished brass case with beveled glass top.

No. 40,470 75¢ Ppd.

(B) Great for youngsters, party prizes. 16mm diam. Pkg. of 6.

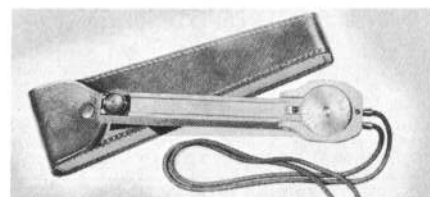
No. P-40,468 \$1.00 Ppd.



LENATIC COMPASS

This is also called a marching compass. Look through magnifying lens to find direction you're heading. Has hairline guide for sighting on distant objects while reading the position in degrees or mils. Has luminous paint on 4 points of compass and reference marks on revolving dial for night use. Folds compactly for easy carrying in the field. Dial measures 1 1/2" in diameter. Complete with velvet, drawstring pouch. Has directions included.

No. 30,235 \$3.95 Postpaid



FIELD RANGEFINDER WITH LEATHER CASE

The Field Rangefinder is extensively employed in the following industries: telephone, power and utility, photographic, mapping, underwriting and insurance, contracting, surveying, factory & farm maintenance, home repairs.

The Field Rangefinder is based on the triangular principle employing two strongly contrasting images. Just look through the eyepiece at the object to be measured and adjust the calibrated dial until the white image is superimposed exactly on the gold one. The accurate distance from the observer's eye to the object is then read on the dial. Distance is read in feet from 8 to 100. Is accurate to within 2%. Includes a handsome genuine leather carrying case, neck cord and directions. 8 1/4" long. Weight 12 oz. including case. Regular direct vision model.

No. 50,137 \$32.50 Postpaid

Erecting Prism Model for overhead viewing of telephone and power wires. No. 50,138 \$43.00 Postpaid

PRECISION REGISTRATION GRIDS



For templates, printed circuit diagrams, micro patterns, maps and charts, engineering drawings, offset copy paste-up, etc. Made of Du Pont's "Cronar" . . . thermal coefficient of expansion 15x10⁻⁶ in./in.°F; humidity coefficient 11x10⁻⁶ in./in. % RH; fold endurance 20,000 + cycles; stiffness 600,000 PSI. Thickness .007".

With .100" (10 to the in.) rulings, Accurate to ± .0005".

No. 80,082 Size 36" x 36" \$35.00 Postpaid

No. 60,367 Size 12" x 18" 8.00 Postpaid

No. 40,666 Size 6" x 6" 2.00 Postpaid

With 2mm (5 to the cm.) rulings, Accurate to ± .01.

No. 80,084 Size 90 x 90 centimeters \$35.00 Postpaid

No. 70,628 Size 30 x 45 centimeters 8.00 Postpaid

No. 60,369 Size 15 x 15 centimeters 2.00 Postpaid

MAP MEASURER

Roll along route on map. Tells you distance in miles, naut. miles, kilometers, 1 mile to in., 1 naut. mile to in., 1 kilo to cent. With leather sheath. No. 40,469 \$2.25 Ppd.



STUDY OPTICAL ILLUSIONS AND HYPNOTISM

Slightest movement of lenticular surfaced, plastic discs, instantly sets pattern in a whirl. Fascinating, spellbinding, holds eyes hypnotically. Demonstrate principle of rotating vortex. 1 1/2" diam. Pkg. of 4.

No. P-40,648 \$1.00 Ppd.

MISCELLANEOUS ITEMS

MULTI-USE STOP WATCH

Ideal for general industrial, military, school, laboratory and sports uses. It has decimal timer so highly recommended for study use. Reset button locks . . . cannot be reset while running. Anti-magnetic, water-protected. Self compensating for changes in temperature. Jewel movement and an unbreakable mainspring. Dial registers in 1/5th seconds. One revolution of long hand every 60 seconds. Small hand registers up to 30 minutes. Dial is divided into 1/100ths of a minute for time study work. Start, stop, continue from any reading by pushing crown. Push side reset button and all hands return to zero. Chrome-plated case.



No. 30,371 \$24.00 Ppd.

Similar to Above, but with 7-jewel movement and dial reading in 1/10 seconds. No decimal timer.

No. 40,472 \$28.00 Ppd.

LOW-COST, QUALITY STOPWATCH. Similar to No. 40,472 above (dial reads in 1/10 seconds) but 1 jewel only. Has side reset button, but without locking feature.

No. 40,817 \$9.95 Ppd.

EYEGLASS WEARER'S KIT IN PLASTIC BOX

Includes jeweler's screwdriver, 8 assorted hinge screws, 4 rubber hinge rings, 10 nose and temple pads, adjustable elastic headband, 9" x 8" anti-fog cloth, 16" x 18" silicone cloth, case clip, wall holder, liquid lens cleaner in spray bottle, identification labels for temples, complete instructions. **No. 60,552 \$5.00 Ppd.**

HIGH SPEED THERMOMETER MEASURES

—10°F to +150°F in 5 Seconds



Pocket-size thermometer accurately measures temperatures of skin, rooms, cars, tools, factory equipment. Perfect for checking home and car air-conditioners. 1 1/2" diameter by approx. 3/4". Gold anodized, plastic bezel. Imported.

No. 40,989 \$3.00 Ppd.

POCKET SIZE HAND WARMER

Fishermen, hunters, campers . . . this model fits hand, warms without a flame. Gives off heat for 24 hours on one filling. Nickel-plated case has hole for lighting cigarettes, 3 3/4 x 2 5/8 x 1 1/2" thick. Approximate wt. 2 1/2 oz. Includes velveteen bag & instructions.



No. 40,610 \$1.39 Ppd.

FAST, ACCURATE SPLIT IMAGE TRANSIT



Here is a clever little instrument with which one man can do any leveling, incline-measuring job quickly and accurately. It will measure incline down to the thinness of a dime at 25 feet. Has level in top and adjustment screw in back. Clever mirror system not only indicates level, but shows also exactly how much correction is needed. So accurate that it can even be used instead of expensive

surveying equipment. Easy to operate as a simple, twin-lens reflex camera. An instrument with a thousand uses.

No. 70,176 \$9.95 Postpaid

VIOLET-GLOWING PHOSPHORESCENT TAPE

For safety markers and decoration. In the dark, after being exposed to light, it glows a beautiful violet. 4" wide, adhesive back. Govt. cost over \$70.00 per 20 yds. 3-foot roll.

No. 60,449 \$1.25 Postpaid

20-yard roll.

No. 70,692 \$11.50 Postpaid

NEW 2-SIDED ADHESIVE TAPE



Sticks anything to anything. Absolutely the best we could find. Neat, invisible, strong. Resists moisture and is not affected by temperature. For mounting, sealing, hanging & repairing. 3/4" tape easily separated from 1" carrier strip by means of 2, 1/8" finger lift edges. 108' roll (1296") in dispenser package.

No. 60,399 \$2.85 Ppd.

IMPROVED! BATTERY POWERED TURNTABLE

Ideal for your Science Fair project, classroom demonstrations, window or counter displays. Holds any well balanced display up to 5 lbs. Made of strong polypropylene. Large 8" diam. platform. 3 3/4" high. Rotates more evenly on needle bearings at approx. 4 RPM. Operates on two flashlight "D" batteries.



No. 70,412 \$9.50 Ppd.

SWINGING DISPLAY MOTOR



Add animation, swinging motion to your Science Fair, school projects or advertising displays with this low-cost battery-operated motor. Compact . . . measures only 5 1/2" high, 3" wide, 1" deep. Operates for months on 2 large flashlight batteries (not included).

No. 60,192 \$2.75 Postpaid



12-V PORTABLE FLUORESCENT LIGHT

Plugs into cigarette lighter of your car. Will run for 16 hours on car battery without having to start motor. Uses less power than parking lights. Excellent for camping trips, picnics, in the garage or on the patio. Useful for farms or boats. 18" aluminum lamp with light fixture, power pack, 15 watt tube, and 35-ft. cord.

No. 70,357 \$19.50 Ppd.

GEAR ASSORTMENT

Sixteen quality spur gears for only \$1.50. Brass, nylon and steel gears are perfect for experiments in mechanical motion. Sizes range from 1/16" to 1 1/4" in diameter. 24, 32 and 48 pitch.



No. 60,352 \$1.50 Ppd.

BEGINNER'S ROCK AND MINERAL SETS



Fine introduction to the interesting hobby of rock collecting. Larger set offers 36 specimens including gold ore, limestone, volcanic cinder, uranium; and a big 67-page book, "Introduction to Study of Rocks & Minerals," with locations, uses and descriptions. Smaller set contains 18 specimens, and a 32 page booklet.

18 Specimen Set.

No. 40,328 \$1.25 Ppd.

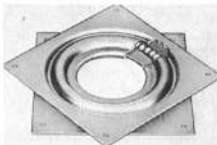
36 Specimen Set

67 pg. booklet

No. 40,329 \$2.75 Ppd.

See more collector's sets and handy display shelves on page 25.

BUILD HEAVY DUTY TURNTABLES



With these four sizes of all steel, precision ball bearings (3", 4", 6", 12") you can easily build heavy duty turntables up to 60" diam. For weights up to 1000 lbs. Use them in sequential assembly equipment, parts racks, office machine stands, advertising displays, corner cupboards, coffee tables, boat seats, ceramics and sculpture equipment, etc. Constructed of heavy gage zinc plated steel. Deep ball races filled with precision balls. Only 5/16" thick, they provide maximum stability and smooth operation. Easy to attach, screw holes offset in top and bottom plates so load bearing sections clear each other. Bearings can be reversed or inletted to reduce height. Provision for blind fastening.

No.	Plate Size	Center Hole	Turntable Size To	Load Lbs.	Wt. Oz.	Price, Ppd.
40,600	3" sq.	1 1/2"	18"	200	4	\$1.00
40,601	4" sq.	2 1/2"	30"	300	6	1.25
40,602	6 1/4" sq.	4 1/2"	48"	500	10	1.50
60,327	12 1/2" rnd.	6 5/8"	60"	1,000	30	3.95

HEAT-RESISTANT TITANIUM SCREWS

War surplus. Experiment with this 1/2-pound assortment of torque and Phillips head screws made from this most unique of all metals. Machine parts from larger ones. 92.7% titanium (3% manganese, 3% aluminum, 1.3% other metals). High tensile strength, melting point of 3272° F., atomic weight 47.90.

No. P-60,595 \$2.00 Ppd.



GLASS DEGREE CIRCLE

War surplus. Use this 10"-diam. x 1/2" thick disc as an instrument window or mount for rotation. Has 8 1/2"-diam. scale graduated every 2° and numbered every 30°. Read through glass. Wt. 3 lbs. 8 oz.

No. 70,840 \$10.00 Ppd.



TUNING FORKS

NON-TARNISHABLE ALUMINUM

Greater sound output and capable of vibrating for longer period of time.

Set of 8. Produces the diatonic scale, C to C'. Includes: C-256 vps, D-288 vps, E-320 vps, F-341 1/3 vps, G-384 vps, A-426 2/3 vps, B-480 vps, and C-512 vps.

No. 50,336 Complete set of 8. \$30.00 Postpaid

SINGLE ALUMINUM TUNING FORKS.

NOTE	VPS	STOCK NUMBER	PRICE, PPD.
C	128	40,934	\$4.95
C	256	40,933	4.25
E	320	40,936	4.20
G	384	40,937	4.10
A	440	40,938	4.50
C	512	40,939	4.00
	1000	40,940	6.00

BRIGHT, CHROME-PLATED STEEL

Set of 10. Accurately calibrated within 1/200% of tone. Stamped with frequency and scale letter. 6 1/2" to 10 1/2" long. Includes: 100 vps (no letter given), C-128 vps, C-256 vps, D-288 vps, E-320 vps, F-341 1/3 vps, G-384 vps, A-426 2/3 vps, B-480 vps, C-512 vps.

No. P-50,338 \$18.25 Ppd.

CHROME STEEL WITH DULL FINISH

Set of 8. All 4 1/2" long. Includes: A-440 vps, Bb-466.2 vps, C-523.3 vps, A-435 vps, Bb-460.9 vps, C-517.3 vps, A-426 2/3 vps and C-512 vps.

No. 50,340 Complete set of 8. \$8.25 Postpaid

NEW HYDROPONIC GROWER FOR INDOOR PLANTS

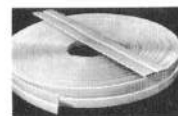
Grow many types of orchids, prize roses, tulips, absolutely clean herbs and vegetables. **AND GROW THEM WITHOUT SOIL!** This decorative walnut and brass grower will provide lively conversation. Grower has automatic feeding system. Nutrient tank in bottom holds exclusive 17-element vitalizer solution that is pumped up into growing chamber at flick of switch. Portable. Operates on 4 "D" flashlight batteries.

Requires only minimal maintenance. Gage in filling funnel indicates when nutrient tank needs vitalizer solution—under average conditions only 1 qt. once each week. You feed the plants only once each day by simply flipping switch on for 1 minute. Overall 8" x 8" x 23 1/2" long; planting bed 6" x 21 1/2" long. With sterile growing medium, gravel, 9-weeks supply of vitalizer and instructions (batteries not incl.).



No. 80,094 \$39.95 Ppd.

Vitalizer Concentrate only. 8-oz. plastic bottle (max. 16-week supply.) **No. 60,571 \$1.95 Ppd.**



POLYPROPYLENE PIANO HINGE TOOK 1,000,000 FLEXES WITHOUT FAILURE

Perfect for boats, doors, bins, boxes . . . at sea, around the house or in the factory. Resists acids, oils and grease. Can be screwed, punched, sheared, stapled or simply nailed in position. Colorfast white, 1 1/2" wide x .100" thick. No holes.

100-ft. coil.
25-ft. coil.
6-ft. coil.

No. 70,778 \$25.00 Ppd.
No. 70,779 7.00 Ppd.
No. 60,519 2.00 Ppd.

HEMOSTAT SURGICAL PLIERS

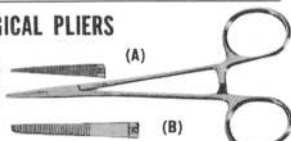
Here's your third hand for handling small items safely and quickly. Use it for flytting, to remove hooks from fish, or picking up flies. Invaluable aid in assembling miniature parts for toy trains or other hobbies. Many industrial uses! Jaws lock closed for holding parts together—free both hands for easy soldering. "Jaws" are serrated for good grip. Tip A for extra small work.

Tip A. "Mosquito" 5"

Tip B. "Kelly" 5 1/2"

No. 40,570 \$2.50 Postpaid

No. 40,571 \$3.00 Postpaid



COMBINATION-TYPE STETHOSCOPE



This sensitive combination-type stethoscope was designed for use by physicians. Because it is extra sensitive, it is ideal for use by engineers, mechanics and others to check trouble spots in motors, liquid flow, etc. Through the magnification of usually inaudible sounds, you can trace feed-line clogging, improper piston firing.

No. 50,270 \$7.50 Postpaid

See Stethoscope—Page 49

ANEROID-TYPE BLOOD PRESSURE GAUGE

Complete with metal hook cuff. Scale graduated 20 to 320mm. Includes carrying case. Imported.

No. 50,271 \$24.50 Ppd.



MISCELLANEOUS ITEMS



SHIP'S CLOCK STRIKES BELLS FOR EACH WATCH

- Strikes every half hour, 1 bell, 2 bells, etc. (up to 8) during each 4-hour watch.
- Jeweled movement by one of West Germany's finest clockmakers . . . runs 6 days on one winding.

Authentic, wall-mounting precision timepiece for your boat, living room, dining room, hall, den, etc. One bell indicates 12:30, 4:30 or 8:30; two bells indicate 1:00, 5:00 or 9:00, etc. Dial shows standard (and 24-hour Navy and Yachtsmen's time in smaller numerals) also traditional ship's watches.

Complete with cabin temperature indicator. Case of heavy lacquered brass (or chrome) is 7 1/8" in diam. x 3 3/8" deep. Has drilled flanged back. Hinged door has domed glass crystal and latch. Time and bells driven separately . . . time has regulating lever. Brass mounting screws, key and instructions included. Wt. 5 lbs. Guaranteed 1 year against manufacturing defects. Brass case.

No. 70,781 \$75.00 Postpaid

Chrome-finished brass case.

No. 70,782 \$75.00 Postpaid

See Barometer-Thermometer with nautical flavor, page 8.

NEW POCKET STAPLER Offers size & convenience of fountain pen

Smartly styled, lightweight stapler for office, home or classroom is always within easy reach in pocket or purse. Eliminates digging for clips and pins, gets that big stapler off your desk. Simply press between thumb and forefinger to securely fasten up to 12 sheets with small, lightweight staple. Precision mechanism with 12 years of proven dependability.



Packs 100 (1/4" wide) staples inside bright metal and black plastic barrel with pocket clip. Loads easily and loads in 15 seconds. Only 5 1/4" long x 1 1/2" diam.; wt. 1 1/2 oz. With 1,000 staples and instructions. Fully guaranteed against manufacturing defects.

No. 40,878 \$5.00 Ppd.

Staples for above (4,000). **No. P-40,879 \$1.30 Ppd.**

FOR YOUR COMFORT'S SAKE . . . USE A PRONE POSITION TV VIEWER



Everyone enjoys television much more when relaxed and comfortably reclining on favorite layback chair, sofa, or bed. This device, placed over your eyes allows you to watch television, read or look through window when in horizontal position. Two superior quality mirrors do the trick, without distortion. One-piece case of shatter resistant plastic measures 2 3/4" deep x 4 1/4" high x 6 1/4" wide. Lightweight, only 3 3/4 oz.

No. 70,668 \$1.95 Postpaid

RECTANGULAR, 3-MINUTE TIMER

Perfect for timing telephone calls, eggs, length of player's turns in word games, etc. Embedded in clear, plastic block, 1 1/2" x 3 3/4". Practical, decorative and very sturdy. Will not break if dropped on floor. It's a must for every household. Makes a useful gift or party-prize. Imported. Weighs 4 oz.

No. 40,980 \$1.00 Ppd.



SURPLUS, 3 DIGIT 0 TO 99.9 COUNTER

Manufactured to rigid Gov't. specs. by Veeder-Root. First digit registers direct reading, 1/10 of a revolution. Second and third digits register complete revs. to 99. Non-resettable. Side mounting #4-40 spur holes. Driven by 11 tooth, 1 3/32" spur gear. Size 1 1/8" x 1 1/8" x 1 7/8".

No. 40,381 \$1.00 Ppd.



STOP FUMBLING FOR KEYHOLES

Attach this, American designed and manufactured, miniature light to your most important key. Simply squeezing case projects a bright beam to light keyholes, read maps and programs or search your purse. Microminiature lamp, smallest ever produced on assembly line, is wired with platinum and powered by self-regenerating, silver energy cell, specially developed for space travel computer circuits. **GUARANTEED FOR A LIFETIME.** Unit is far superior to foreign imports which exhaust battery within a short period. No batteries or bulbs to buy ever. Handsome black case of durable plastic measures 1 1/4" x 1/2" thick, has fleur de lis emblem and silver-finished metal trim.

No. 60,431 \$2.95 Postpaid

PURE SILICON SEMICONDUCTOR WAFERS WITH UP TO 600 PROCESSED TRANSISTORS EACH

Fascinating addition to your collection of science items or chemical elements. Advanced electronic experimenters, using 5-mil copper wire and micro-miniature soldering iron, can use to make their own transistors. Manufacturer's rejects (mfg. cost \$75.) but with many good transistors in the pattern. Sliced from pure silicon ingots, lapped, polished, then given transistor junctions. Wafers are approx. 1" in diam. x .010" thick in clear plastic box.

No. 40,845 \$1.00 Ppd.

SYNTHETIC RUBY AND SAPPHIRE ASSORTMENTS

Make gem stones, knife-edge fulcrums, scribes, tool hones and many other items. These useful assortments cover many industrial, hobby, and experimental needs.

Synthetic Ruby

Actually synthetic sapphire produced from Al₂O₃ with chromium oxide added for deep red hue. Extremely hard, 9 on Mohs' scale, and takes high polish. Excellent for making



jewel bearings with an unusually high coefficient of friction. For thread and wire guides, styli, pivots, rollers, insulators. This 2 1/2-oz. assortment includes fractured boule ends approx. 1/2" in diam. of varying lengths. Each piece weighs from 10 to 25 grams.

No. 40,965 \$3.00 Ppd.



Synthetic Sapphire

A versatile assortment of synthetic sapphire for cutting and etching glass. Hardness of 9 on Mohs' scale. Made from Al₂O₃ these interesting synthetic industrial gem fragments are actually purer than their natural counterparts. Assortment includes clear sapphire, white sapphire (formed by heat from clear sapphire powder and a binder) and small red ruby (synthetic sapphire with chromium oxide added for deep red hue). **Sample Box** (9 small pieces). Rods incl. approx. 3/32" diam.

No. 40,844 \$1.00 Ppd.

Larger Assortment for industry, collectors, etc. Approx. 50 pieces (rod ends, boule ends, small blocks, etc.).

No. 60,555 \$4.00 Ppd.

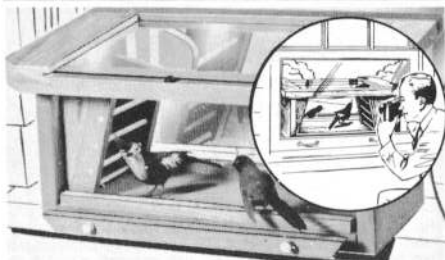
See new Rock Tumblers,
Polishing Grits, etc. on page 7.

PHOTOGRAPH AND WATCH BIRDS ONLY INCHES AWAY!!

Exciting, half-aluminized material (a one-way mirror) has numerous other applications too:

- Excellent for industrial and school research projects
- School Science Fair Projects . . . nature study, etc.
- Crime prevention . . . detecting shoplifters, etc.

Birds don't suspect, don't frighten or fly away. Take glorious close-up photos with any low-cost supplementary lens. Weather-defying redwood feeder attaches to window sill. One-way, 21" x 36"; half-aluminized film attaches to inside of window and functions as mirror on brightly lit side (birds see only their reflections) is nearly transparent on other. Take photos through film, or cut hole to fit camera lens. Feeder has open back, 6 1/2" x 13 1/2", and hinged roof with glass insert. Suet rack, seed hopper and full-length perch. Overall 17" x 8 1/2" x 9 1/2" deep. Wt. 6 1/2 lbs.

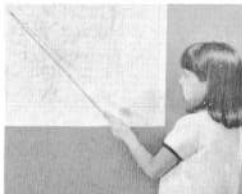


Feeder and Film.
Feeder only.

No. 70,737 \$9.95 Ppd.
No. 70,736 \$6.95 Ppd.

Half-aluminized Film only.
21" x 36" Film sheet.
10 1/2" x 18" Film sheet.

No. 70,326 \$3.00 Ppd.
No. 60,113 \$1.00 Ppd.



TELESCOPING POINTER-PEN

FOR EXECUTIVES, TEACHERS, STUDENTS, SALESMEN.
Extends from 5" pen to 24" pointer.

Point out highlights in home movies, slides, business charts, blackboard lessons—then instantly you can slide this unique telescoping pointer down to a fine-writing ballpoint pen for taking notes, signing letters, etc.

Never before have two such useful instruments been combined to aid busy students and professional people. A great asset, and really fun to use. Attractive, chrome-plated brass instrument with seven round, telescoping sections (have 1" markings for use as rule), pocket clip and point cap. In plastic pouch with extra refill.

No. 40,856 \$2.50 Ppd.

Extra Refills (Pkg. of 3).

No. P-30,573 \$1.20 Ppd.



NEW BALL POINT PEN WRITES IN 12 COLORS!

Excellent for work that must be coded . . . different types of corrections on copy, bars or lines on graphs, etc. Children will love coloring and drawing with this clean, fun-to-use, "automated ball point".

Simply pull back on spring-loaded, transparent plastic selector top and then dial your choice of pen points—red, dark blue, black, light brown, yellow, orange, pink, light blue, light green, dark brown, dark green, violet. Plastic body, 6" long x 3/4" in diameter.

No. 60,575 \$1.75 Ppd.
No. 60,901 \$.85 Ppd.

One 12-color Refill.

MARK OVERLAYS AND TRANSPARENCIES THEN, EASILY REPLACE THEM

Set of fiber-point pens containing specially formulated ink that will not fade from heat. Perfect for overhead-projector transparencies, acetate overlays for maps, charts, graphs, posters, etc.; or for writing on regular paper. Flows smoothly, does not smudge or smear. Wipes off transparencies with a damp cloth. Extra-fine points make sharp, clean lines. Fine visual-aid accessories and marking pens. Set of 4 pens (red, blue, green and black) in convenient, plastic pocket-pouch. No. 41,006 \$2.35 Ppd.



NEW PENLIGHT WITH SUPERIOR ROTARY SWITCH

Magnetic holder pictured available separately for instant mounting on any metal surface.

Rotary switch eliminates accidentally turning on and draining batteries. Attractive, chrome-finished light with pocket clip throws sharp, bright beam. Measures 5 1/2" x 3/8" diam., takes two "AA" batteries (not incl.). Slips into rubber arms of magnetic holder below, making excellent emergency or work light, map-reader, etc. Penlight only. No. 40,900 \$1.00 Ppd.

Holder only (bonus bulletin board magnet included).

No. 40,903 \$1.00 Ppd.



NEW! TINY ELECTROMAGNETS

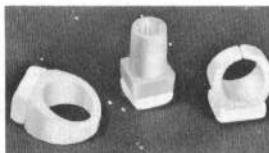
Experiment, demonstrate electromagneticism. Only 1 3/8" x 3/4" (wt. 1/2 oz.) yet lift 5 oz. at 6V, DC. Bank several. Pkg. of 4. No. P-40,968 \$2.00 Ppd.

SAVE TIME, TROUBLE & MONEY . . . USE EDMUND PIK-UP RINGS & PENCIL TOPS WITH EDMUND-TAK



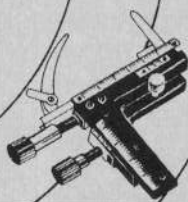
Speed up page and paper turning, handling and collecting by over 50%. Quickly sort, collate and count papers, production and assembly line articles, etc. PIK-UP Rings and Pencil tops stick to a page, lift it instantly and then pull away easily without leaving any stain. On the end of each is our new reusable adhesive, Edmund-TAK. Lasts for months; will not dry out. Just knead occasionally for clean, new, sticky surface. Card with 2 different size, rings (to fit almost any finger), pencil top and 24-page illustrated booklet. No. 7100 98c Ppd.

Box of Edmund-TAK for office use. Hundreds of uses in home or office. Plastic box with two 3/4" x 2 1/4" x 3/4" pieces plus a Pencil Top. No. 40,776 \$1.00 Ppd.
Replacement Edmund-TAK. Enough for 24 rings or pencil tops. No. 40,778 \$1.00 Ppd.



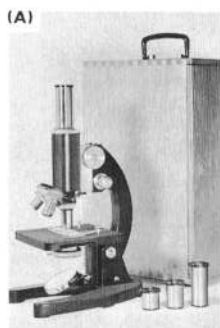
MICROSCOPES-ACCESSORIES

- STUDENT
- STEREO
- MEASURING
- MECHANICAL STAGES
- RETICLES
- ILLUMINATORS

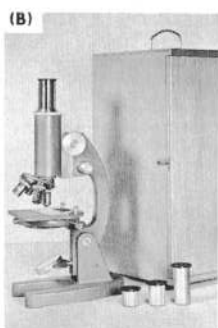


Microscopy is a fascinating hobby and can be of special value to anyone pursuing a technical or professional career. Industry saves millions of dollars yearly by employing them for inspection, research, etc. If you want an inexpensive beginner's microscope, we list one for only \$16.50 postpaid. This is described in detail on page 63. It's an excellent microscope for grade and high school boys and girls.

Professional-Quality Laboratory Microscopes



Gives 25X, 50X, 75X, 100X, 150X, 300X, 600X & 900X.



Gives 50X, 100X, 150X, 200X, 300X, 450X, 600X & 900X.

(A) FULL-SIZE MODEL 11 $\frac{3}{4}$ " HIGH, 25X to 900X

Professional, monocular-type microscope of superior quality and workmanship. Excellent for school and college laboratories. Precision optics combined with sturdy medium-sized base. See specifications in table below.

All optical elements are standard professional size. Objectives are parfocal. Automatic focusing stop prevents damage to objectives and slides, fixed 160mm tube. Rack and pinion coarse focusing and fine micrometer type slide fine adjustments. Complete with 3 eyepieces and 3 objectives in fitted hardwood cabinet with carrying handle. Shpg. wt. 11 lbs.

No. 85,049 \$89.95 Trans. Charges Collect

Note: Attachable Substage Illuminator, No. 50,222, fits the mirror pin socket of the above microscope.

(B) SMALLER MODEL, 10 $\frac{7}{8}$ " HIGH, 50X to 900X

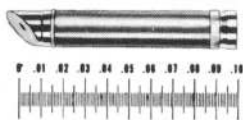
This precision-made, all metal microscope has dual-control, rack-and-pinion coarse and fine focusing adjustments. It has three eyepieces, four objectives mounted on quadruple revolving nosepiece, centerable metal stage, 5-aperture disc diaphragm and plano-concave mirror. See specification table. Supplied complete in fitted hardwood cabinet. Although eyepieces and objectives are not standard size, it is an excellent instrument. Made in Japan, inspected and guaranteed by Edmund.

No. 70,513 \$62.00 Postpaid

Stock No.	Achromatic Objectives	Eyepieces	Stage	Substage Equipment
(A) 85,049	Coated objectives 5X (0.10 NA), 10X (0.25 NA) 60X (0.85 NA); triple revolving nosepiece.	5X, Huyg. 10X, W. F. 15X, Huyg.	Bakelite, 4 $\frac{3}{8}$ " x 4 $\frac{1}{2}$ "; two stage clips. Drilled and tapped for Mechanical Stage No. 30,058 (page 65), also accepts Mech. Stage No. 30,060 (page 65).	Fixed-condenser lens, iris diaphragm, 1 $\frac{7}{8}$ " diam. plano-concave mirror
(B) 70,513	Objectives: 10X, 20X, 30X, 60X; quadruple revolving nosepiece	5X, Huyg. 10X, Huyg. 15X, Huyg.	3 $\frac{3}{8}$ " x 3 $\frac{3}{8}$ " centerable metal stage complete with two stage clips.	Five-aperture disc diaphragm, 1 $\frac{5}{8}$ " plano-concave mirror

50X, POCKET-SIZE DIRECT MEASURING MICROSCOPE

No longer than an ordinary fountain pen. Ideal for direct measuring and examining minute objects. Use for checking and measuring small parts, for quality control, to speed up production, to detect inferior merchandise, etc. Reticle is calibrated for measuring $\frac{1}{10}$ " by .001 divisions. Estimates to .0005" can easily be made. You make direct readings from reticle, no calculations necessary. Chrome reflector at base of instrument reflects light onto objects being examined or measured. Excellent for checking hi-fi needles. **No. 30,225 \$7.95 Ppd.**



50X MICROSCOPE



Same as above except reticle is not included. Carry it in your pocket for all kinds of inspection. Instructions included for adapting it to any camera for photomicrography. Gray enamel finish, 4 $\frac{1}{8}$ " x $\frac{5}{8}$ " diam.

No. 30,013 \$2.70 Postpaid



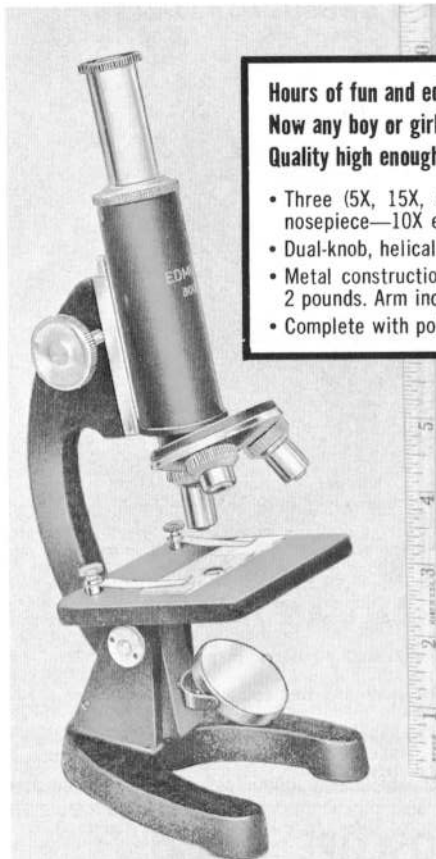
Only \$4.50 Ppd.

50X MICROSCOPE AND 10X TELESCOPE BOTH IN ONE INSTRUMENT . . . Ideal For Field Trips

Used as a microscope, it enlarges 50 times. Examine hi-fi needles, insects, crystals, minerals, etc. Simply tilt it to focus. Highly polished, metal reflector throws plenty of light on the object. For use as telescope, unscrew reflector, draw out eyepiece and focus. Distant objects look approx. 10 times closer. Chrome and black finish. Pocket size, handy pocket clip. Not to be confused with cheaper models having lower optical quality.

No. 30,059 \$4.50 Postpaid

50X, 150X, 300X MICROSCOPE



**Hours of fun and education for only \$16.50 Ppd.
Now any boy or girl can see the invisible world.
Quality high enough for many school or industry uses.**

- Three (5X, 15X, 30X) achromatic objectives on triple revolving nosepiece—10X eyepiece
- Dual-knob, helical rack and pinion focusing
- Metal construction, over 10" high. Properly balanced, weighs over 2 pounds. Arm inclines for easy viewing
- Complete with polished wooden carrying case

EVERY BOY OR GIRL SHOULD OWN ONE

Biology courses are now taught in practically all schools from the elementary grades through college. Experience at home with a microscope will be of great help to any youngster. No matter what career is selected, the knowledge gained from experimenting with a microscope will always be invaluable.

EXAMINE MOLDS, SEEDS, CLOTH, INSECTS

You can do detective work, detect tobacco cheapening, spot food adulteration and bloodstains. Right in the home, rain or shine, you can do fascinating experiments with things readily available. Examine a few drops of pond water, grains of sugar, hair, textile fibers, salt, etc. See yeast or small living insects. This microscope is an excellent basic tool for Science Fair Projects, Engineering Fairs, or Future Scientists of America activities which are now enjoyed by students in practically all schools.

You can make good use of this microscope for research projects. Once it was mainly boys who used microscopes, but in this scientific stage, more and more girls are interested in microscopy and want their own optical instrument. This is one that anybody would be proud to own. Below are just a few of the reasons why this is the microscope for you.

WHY WE GIVE THIS MICROSCOPE OUR STRONGEST RECOMMENDATION

SUPERIOR OPTICAL PERFORMANCE



Other inexpensive microscopes have only one, two or three simple lenses for objectives. The three objectives on this microscope are optically ground and polished, cemented, color-corrected, achromatic objectives as shown at left. You get no color fringes.

ONE PROFESSOR COMMENTED ON THIS MICROSCOPE AS FOLLOWS...

"Your compound microscope is an amazing instrument for the price. It shows the detail in organs satisfactorily. In a laboratory examination in histology, cells, nuclei, cytoplasm all can be made out clearly. It can satisfactorily introduce the young scientist to accurate observation of the microanatomy of living things. For \$16.50 he will get many hours of enjoyment."

For added enjoyment, order Mechanical Stage No. 30,060, on p. 64.

No. 70,008 Only \$16.50 Postpaid

MAGNIFICATIONS RANGE FROM 50X TO 300X

We have included in this very popular microscope a wide range of useful powers. 50X is excellent for examination of insects and other small things. Yet you have at your command powers up to 300X which is high enough to see many bacteria, etc. Such a range of magnification is not found on most other microscopes at this low price. A 50X accessory objective listed below is also available. It will bring your top magnification up to 500X.

OBJECTIVE TO GIVE YOUR MICROSCOPE 500X

50X Achromatically corrected, 3mm F. L. Threaded for easy attachment to nosepiece.

No. 30,197 \$5.00 Ppd.

EDMUND'S OWN MICROSCOPE ACCESSORIES KIT

Here are all the materials needed in one kit. Includes book "Hunting with the Microscope," prepared slide, well slide (for use with liquids), our "make-your-own" slide kit of glass slides, cover glass and balsam, a polarizing filter set, 7-pc. dissecting set, stains, shrimp eggs, instructions.

No. 70,504 \$9.95 Ppd.



MICROSCOPES - MEASURING

MEASURE DIRECTLY WITH ERECT IMAGE LOW POWER MICROSCOPE—6X, 10X & 20X Only initial calibration required.

- Direct Reading Scales
- 2-Scale Reticle For 10X And 20X
- Most Optics Low-Reflection Coated
- Wide-Field Eyepiece with Light Shield
- Horseshoe Base And Stand

IDEAL FOR ALL THESE USES

- Seed and plant inspection
- Textile examination
- Stamp and coin collecting
- Termite inspection
- Engraving and printing
- Dissecting of insects
- Inspection of paint, finished and machined surfaces and castings
- Examination of grains of sand
- Examination of snowflakes
- Rock and mineral collecting
- Microcard and microfilm reading
- Repairing watches and instruments

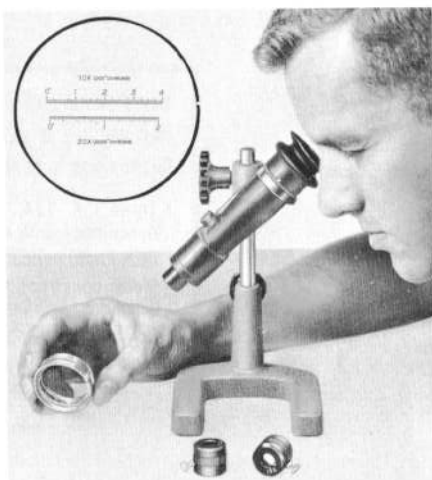
SPECIFICATIONS

Total Power		
6X	10X	20X
Working Distance		
4 7/8"	2 5/8"	1 3/8"
Field of View		
3 3/4"	1 1/2"	1/4"

In manufacturing this microscope, we have been able to adapt an expensive, sturdy and precision war-surplus optical instrument. Thus, you pay only \$39.95, but you get \$80.00 worth of value. The unit is American made.

Tool rooms, laboratories, inspection departments, and printing shops are but a few places where it can be used. Has a .4" scale with .005" graduations for use with 10X; 2" scale with .0025" graduations for use with 20X.

The image is erect and objects appear to move in the eyepiece in same direction as they do under the microscope. The optical system has excellent color-correction. Basic 6X scope includes achromatic objective and wide-field eyepiece. Rubber eyeguard shuts out extraneous light. Because of the ample eye relief, this microscope is ideal for those who wear glasses. Other powers of 10X and 20X are provided by accessory lenses mounted in cells that slip over the basic objective. The cell, pro-



viding 20X total magnification, contains an expensive achromat that insures better detail under this power. Dual knob rack and pinion focusing, has 3 1/2" excursion. Vertical pillar, 8" high can be extended another 3" and locked in position. Distance between the microscope objective and table top can be varied from 1 1/8" to 7 1/2".

The 2-lb. cast iron horseshoe base measures 4 1/2" x 4 1/2". Microscope complete wt. 4 lbs. Directions incl. **No. 70,266 \$39.95 Ppd.**

Stand only. Horseshoe base, post and focusing arm. **No. 50,192 \$10.00 Ppd.**

Accessory Objective for 40X. Working distance 5/8". Field 3/4". (Reticle not usable.) **No. 30,293 \$4.75 Ppd.**

FREE TRIAL Test it for 10 days. If not completely satisfied, return it for full refund.

NEW LOW-COST 50X MICROSCOPE FOR DIRECT MEASUREMENT TO .001"

Versatile Instrument Combining HIGH POWER, ACCURACY and PORTABILITY . . . Designed by Edmund to save you Dollars

Powerful, pocket size scope with glass measuring reticle (scale) is mounted in clear plastic base . . . ideal for direct linear measurement and examination of minute objects. Use for quality control, to speed up production, to detect flaws, scratches, inferior merchandise, etc. Excellent for surface measurements of metals, fibers, printing, etc. Linear scale is 1/10" long and has .001" divisions.

Easy to carry in your pocket or tool chest, because it stands only 4 1/2" high, has 1 1/2" O. D. base. Weighs only 2 oz. Base of transparent Lucite admits plenty of light to scale and work, keeps instrument in sharp focus. Can be focused and locked to suit individual users.

Scope can be removed from base and used alone with chrome reflector included. Reflector throws light onto objects being examined or measured. 50X microscope complete with reflector. **No. 60,465 \$10.95 Ppd.**

When microscope is to be used in dark areas we recommend our **No. 50,076 Illuminator, \$7.95 Postpaid, described on Page 75.**

ADDITIONAL MEASURING ACCESSORIES

Stage Micrometer, 0.005, graduated 0.0001"	page 66
Stage Micrometer, 0.1mm, graduated 0.002mm	page 66
Calibration Scale for electron microscopes	page 9
Microscope and Instrument Reticles	page 69
Book, "Reticles And Their Uses"	page 69
Pocket Comparators with Measuring Reticles,	pages 74, 75, 76



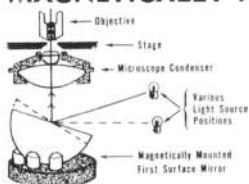
IMPORTED STAGE MICROMETER

One millimeter line, divided into 100 parts (0.01mm) Size 1 x 3". **No. 30,036 \$7.50 Ppd.**

OTHER OPTICAL MEASURING INSTRUMENTS

Field Range Finder with Erecting Prism	page 57
Split image Transit	page 58
Optical Alignment Telescope	page 95
Bore-sight and Alignment Telescope	page 96

MAGNETICALLY MOUNTED FIRST-SURFACE MICROSCOPE MIRROR



✓ **Unlimited Angular Movement**

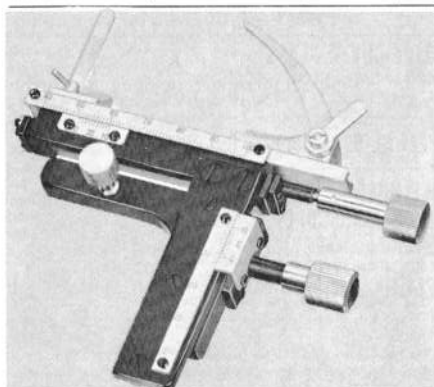
✓ **Excellent for Lab Experiments**

The ease and accuracy with which Dr. Allen's new and patented, magnetically-mounted, microscope substage mirror can be adjusted makes it superior to anything

presently available. Every microscopist should have one. Excellent too for machine shop alignment problems.

First-surface, plano mirror is housed in 1 1/16"-diam. steel hemisphere (reflecting surface is in equatorial plane) and gives a cone of illumination as large or larger than that from a built-in illuminator. Coating is aluminum with silicon monoxide overcoat and is satisfactory for ultraviolet and visible light. Permanent magnetic pillars are mounted in aluminum base so that hemisphere always has desirable 3-point contact . . . and mirror rotates through 0°-90° to plane of base. Flat-bottomed base is itself magnetic. Angle plate, keeper-mount permits permanent horizontal or vertical mounting. Extremely useful with optical bench or breadboard layouts.

No. 40,753 \$12.50 Ppd.



PRECISION GRADUATED MECHANICAL STAGE

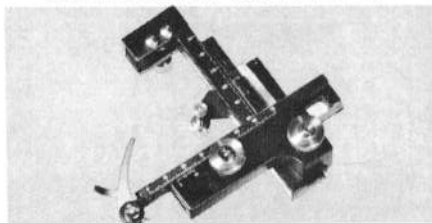
Equipped with Verniers

Particularly Helpful in Relocating Slide Fields

Has 30mm front to back and 50mm left to right excursions. Fixed verniers read to 0.1mm. Dual control knobs, horizontally positioned, are conveniently located on right side. Slide holder with adjustable arm and spring clip accepts both small and large glass slides, max. opening 3 1/4". Unit finished in black and chrome. Two locating pins and thumb screw attach to microscope stage. The latter can easily be drilled to accommodate it. Supplied in wooden case.

No. 30,058 \$36.00 Ppd.

(Stage on Edmund Microscope No. 85,049, listed on page 62, is drilled and tapped for this unit)



ATTACHABLE, GRADUATED MECHANICAL STAGE

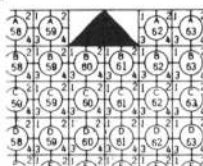
Fits Microscope on opposite page & many more

Sturdy, attachable, graduated mechanical stage with 35mm front to back and 65mm left to right excursions. Has fixed verniers reading to 0.1mm. Dual control knobs are comfortably positioned. Spring finger holds standard 3" x 1" microscope slides. Will fit microscopes No. 70,008, 85,049, and others with stages up to 10mm thick.

No. 30,060 \$12.95 Postpaid

INSTANTLY RELOCATE FIELDS IN ANY AREA OF A MICROSCOPE SLIDE

The entire surface of this very popular 1" x 3" glass slide (partially illustrated) is marked with a square grid at 1mm intervals. Used with a microscope equipped with a mechanical stage, it permits pin pointing a field of interest in a specimen for easy relocation.

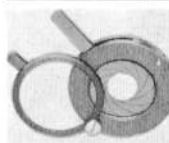


Once field has been identified in the specimen, remove slide and replace with the England Slide Field Finder. Eyepiece crossline pinpoints reference. Record it on slide label (see below). To relocate field, reverse the process. Instructions included.

No. 30,327 \$25.00 Postpaid

Microscope Specimen Slide Labels For Use With Above. Convenient, self-adhesive specimen slide labels printed with unnumbered reference square. 80 labels (two sheets of 40).

No. P-41,010 \$1.00 Postpaid



SUBSTAGE IRIS DIAPHRAGM

Quality built iris diaphragm and filter holder. Has blued steel leaves in brass mount. Apertures, max. 25mm, min. 1mm. Swing-in holder accepts filters 32mm diam. x 1/2mm thick. Unit has threaded shoulder 28mm diam., .5mm

pitch. Finished in black. **No. 40,997 \$7.00 Ppd.**

Note other instrument iris diaphragms on page 94.

HOW HOT IS YOUR ILLUMINATOR?

Place across stage aperture to read temperature reaching slide specimen. Calibrated 40° to 250°F. Measures 30mm sq. x 3-1/10mm thick. Use with other optical instruments.



No. 40,988 \$9.75 Postpaid

ENTIRELY NEW! RAISE LONG-LIVED FRESH WATER PROTOZOA



Few experiences in science match the thrill of raising and observing these colonies of one-celled animals under the microscope. Even if you are able to conveniently collect your own samples, their life span will be approximately 72 hours. These protozoa, bred through 2,000 generations on special food papers, are capable of changing from active, swimming animals to "seeds" or cysts and reversing the process. They live indefinitely with reasonable care. With this 3-pack kit containing dried cysts or "seeds" of hundreds of thousands of protozoa, food papers and methyl cellulose (for slowing movement), you can easily raise these animals. Study at 300X and higher magnifications. From Florida. Completely safe.

No. 40,708 \$1.00 Postpaid

MICROSCOPES-ACCESSORIES

SPECIAL—LABORATORY BARGAINS

Here's a real find for students of general science, biology, chemistry or geology; experimenters or hobbyists. A world famous manufacturer of microscope and general laboratory accessories discontinued production of a number of high quality student items, and we purchased their complete inventory. Both kits below represent a tremendous savings on first quality equipment that every science student will enjoy working with.



(A) MICROSCOPE ACCESSORY KIT ... \$3.00

(B) NATURE STUDY KIT ... \$2.25



(A) MICROSCOPE ACCESSORY KIT. Seven 1" x 3" prepared slides; amoeba, coccus, volvox, lilac, sunflower, hydra, spirogyra; twelve blank slides; twelve slide cover glasses; twelve blank slide labels; bottle of canada balsam cement; bottle of methylene blue staining agent; one 4" medicine dropper; one 4 3/8" forceps; two dissecting needles. **No. 70,861 \$3.00 Postpaid**

See our famous \$16.50 Microscope—Page 63

(B) NATURE STUDY KIT. Includes preserved 2" to 3"-diam. starfish, a horsefly and a honeybee; one specimen each of metamorphic, sedimentary and igneous rock; small pkg. shrimp eggs; small pkg. diatomaceous earth; one 10-cm. plastic ruler; two 4-dram and two 6-dram specimen bottles with caps; one 3/4" glass stirring rod; 1/2 and 1 1/2-dram. vials with stoppers and 4 1/4" forceps. **No. 70,862 \$2.25 Postpaid**



4" TEST TUBES. First quality glass test tubes with tight-fitting rubber stoppers. Package of 25. **No. P-70,863 \$1.75 Ppd.** Package of 100. **No. P-70,864 \$6.00 Ppd.**

LENS CLEANING TISSUE—FIRST QUALITY

This clean soft paper is made especially for cleaning lenses and objectives on microscopes, telescopes, binoculars and other optical instruments. Does not readily collect dust or grease and is free from impurities. Will not scratch the polish of the lens. Low in cost, yet the very same lens tissue used at important army optical manufacturing and maintenance shops. Meets Government Specifications UU-P-313C.

500 sheets (7 3/4" x 10 3/4"). **No. P-736 \$2.80 Ppd.**

500 sheets (7 3/4" x 3 1/2").

No. P-60,375 \$1.00 Ppd.

Lens Brush and Cleaner Solvent Dispenser, page 78

7- AND 13-PIECE DISSECTING SETS

7-Piece Set. Every student of the microscope can use this dissecting set. Comes in neat simulated leather case, ideal for biology, botany, research work, etc. Easy to slip into pocket for field work!

No. 50,002 \$3.25 Postpaid



13-Piece Set. For intermediate and advanced work.

No. 60,394 \$8.00 Postpaid

"MAKE YOUR OWN" SLIDE KIT

It is more economical for those preparing their own slides to buy separate boxes of glass slides, cover glass and balsam. However, for those wanting only a few, here is an assortment of 30 pieces of 3 x 1" slide glass, 30 pieces of cover glass and a vial of balsam.

No. 40,260 \$1.60 Postpaid

STANDARD 1" x 3" PREPARED SLIDES

Each of the following is a box of 12 prepared slides. Each slide labeled for positive identification.

Vegetable Slides.	No. 40,006	\$2.50 Ppd.
Animal Slides.	No. 40,007	2.50 Ppd.
Microscopic Organisms.	No. 40,008	3.00 Ppd.
Asst. Insects, Vegetables, Plants	No. 40,199	2.50 Ppd.

CANADIAN BALSAM CEMENT

Use to cement cover glass to glass slide or for cementing lenses when making your own eyepieces, etc.

No. 40,003 Small Vial 50c Postpaid
No. 40,004 1-oz. Bottle \$1.25 Postpaid

MICROSCOPE GLASS SLIDES

Standard size 1" x 3". Box 72 pieces.

No. P-40,001 \$1.75 Postpaid

SLIDE COVER GLASS

18mm x 18mm. Class 1 (thickness .17mm). Box of 100 pcs.

No. P-40,002 \$1.30 Ppd.

WELL SLIDES No. P-30,091 (Pkg. of 12) \$2.00 Ppd.

BEGINNER'S "HUNTING WITH THE MICROSCOPE" BOOK

A thrilling introduction to the microscope showing what to look for and how to go about it. Covers detective work, cells, blood, bacteria, molds, etc., even the raising of cultures. Paperbound, 125 pages (5 1/2" x 8").

No. 9207 Only \$1.00 Ppd.



"HOW TO USE A MICROSCOPE" . . . W. G. Hartley
Covers optics, manipulation and care of instrument, illuminating system, recording of images, etc. Paperback, 252 pgs. (4 1/8" x 7 1/8"), 135 drawings.

No. 9363 \$1.45 Ppd.

PHOTOMICROGRAPHY WITHOUT A CAMERA

Use this kit with any good microscope and lamp. Produces negative prints (black & white reversed) without camera. Includes one 90° silvered prism, combination projection/printing screen, 4 double-ended clips, safe-light, 3 plastic darkroom trays, pkg. of 4" x 5" enlarging paper, complete set of chemicals and instructions.

No. 70,409 \$7.95 Postpaid

PRECISION STAGE MICROMETERS MEASURES TO 0.0001 IN. AND 0.002MM

These two microscope stage micrometer slides are ruled on glass and inserted into 26mm x 76mm black anodized metal mounts. Ruled area has protective cover glass. Suitable for use with oil immersion objectives.

Stage Micrometer with linear scale 0.005" long, graduated in 50 parts, each measuring 0.0001" and numbered every 0.001". **No. 30,592 \$24.50 Postpaid**

Stage Micrometer with linear scale 0.1mm long. Graduated in 50 parts, each measuring 0.002mm.

No. 30,593 \$24.50 Postpaid

REPLACEMENT LAMPS FOR MICROSCOPE ILLUM.

For Bright Beam and Variable Intensity Models. 30-W, 120-V, Cand. Base. **No. 15,006 \$1.00 Ppd.**

For All-Purpose Illuminator. 75-W, 120-V, S. C. **No. 15,005 \$2.00 Postpaid**

For Regular Microscope Illuminator. 15-W, 115-125-V, Cand. Base. **No. 15,007 60c Ppd.**

All Edmund Illuminators have 6-ft. cord, on-off switch

IMPROVED ALL-PURPOSE ILLUMINATOR

This all-purpose illuminator has been designed for maximum efficiency and simplicity of operation. It meets the exacting requirements of microscopy and is priced within the reach of every laboratory budget. Variable intensity illumination is obtained quickly and simply by fingertip control. Kohler illumination and opaque illumination are obtained by simply removing ground glass and adjusting slider to proper focus. Daylight filter, ground glass, supplied complete with 120V, 75W S.C. projection lamp, cord, plug and on-off switch. Pillar is 5 1/2" high, heavy, cast-iron base measures 4 1/2" x 4 1/2".

Universal mechanical adjustments permit this illuminator to be easily positioned for all normal microscopical requirements. It often doubles as a general laboratory illuminator. On the industrial production line it is ideal for many inspection and quality control applications.

No. 15,000 \$32.75 Ppd.

BRIGHT BEAM ILLUMINATOR FOR MICROSCOPY, INDUSTRIAL USE, CLOSE UP WORK. Very similar to above in size, but especially useful for stereoscopic, toolmakers' microscopes, close work, etc. Produce a variable-size spot of light by sliding focusing tube back and forth. Has two-element condensing system and reflector, 120V, 30W candelabra-base lamp, daylight filter, cord, plug and on-off switch.

No. 15,001 \$27.50 Postpaid

REGULAR MICROSCOPE ILLUMINATOR

Lightweight, all metal construction, substage microscope illuminator with rubberized base to prevent sliding. Widely used by doctors, laboratory workers and amateur microscopists. Has daylight filter, uses 115V, 15W candelabra-base lamp. Measures 3" x 2".

No. 15,004 \$4.95 Postpaid

DUAL FILTER, MICROSCOPE SUBSTAGE ILLUM.

Designed to plug into your standard microscope after removing substage mirror. The illuminator has . . . daylight, white, and ground glass filters. Just turn the illuminator to change them. Equipped with 115V, 15W, single contact, screw-base lamp and 6 ft. cord, plug, on-off switch.

No. 50,222 \$8.95 Postpaid

VARIABLE INTENSITY ILLUMINATOR



Gives 3 different degrees of brightness by simply rotating knob at top of unit. No transformer or neutral filters necessary. Ranges from extra brilliant for binocular, high power, oil immersion, to soft, glareless light for monocular, low power work. All-metal with rubber feet. 6-foot cord, switch and daylight filter. 3 1/2" high.

A must for medical students, physicians, technicians, laboratories and schools. Uses 115V,

30W candl. base lamp. **No. 15,002 \$10.95 Ppd.**



MICROSCOPE EYEPIECES (Standard .917" diam.)

Huygenian eyepieces are the ones most commonly used. Periplan eyepieces; however, give a flatter field and are excellent for use with achromatic and apochromatically corrected objectives (recommended for photomicrography, particularly with eyepiece cameras.) Each is precision made of fine optical glass. (*) Huygenian (*) Periplan (†) Coated.

No.	Power	Price, Ppd.	No.	Power	Price, Ppd.
30,126	5X	\$4.50*	30,130	20X	\$17.75*†
30,128	10X	4.85*†	30,131	25X	20.35*
30,129	15X	5.60*	See reticles on page 69		

Z-O-O-M EYEPIECE FOR MICROSCOPE . . 10 TO 20 POWER AT TWIST OF DIAL



Here is the most important microscope accessory to come along in years . . . the ZOOM EYEPIECE. It does away with all eyepiece changing by combining in one handy assembly all the eyepiece powers from 10X to 20X. Just insert our ZOOM eyepiece into the proper microscope like a regular eyepiece and you have at your command microscope powers ranging from 30X to 2000X. All at the easy twist of a dial . . . no additional focusing . . . no extra eyepiece changing. We're proud to offer you our new ZOOM eyepiece because of its quality construction and amazing low price. It is an extremely well made, all metal mount eyepiece, heavily plated and anodized. Fits into any standard .917" diam. microscope tube. To insure tight but, mar-free attachment, there is a cleverly designed, built-in, adjustable clamping ring. Velvet smooth ZOOMING too! Everything about this eyepiece is professional. You'll be well pleased with it. Overall length 2 3/4", max. diam. 1 1/2". All elements coated. Weight 5 oz.

No. 60,270 \$25.00 Ppd.



30° PRISMATIC MONOCULAR MICROSCOPE ATTACHMENT

Fits into standard microscope to allow inspection without standing up or stretching when you have liquids on your slides and microscope must be kept vertical. Your standard eyepieces slide into this attachment which swivels easily. Black and chrome finish. .917" O.D.

No. 50,264 \$15.00 Ppd.

RIGHT-ANGLE ATTACHMENT

This slides into your standard size microscope and will also hold standard size (.917 O.D.) eyepieces. Use to view or project your slides at right angles. Made of fine plastic. Contains a first surface mirror.

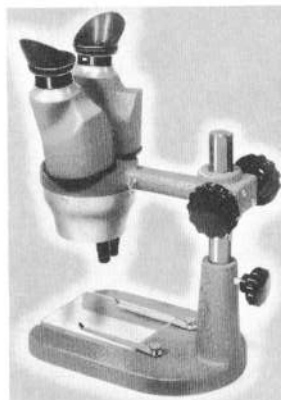
No. 30,278 \$3.00 Ppd.



ACHROMATIC OBJECTIVES (Standard Microscope Size Diameter and Threaded)

Excellent for both visual and photomicrographic use. Give remarkably crisp image, free of residual color. All are designed for tube lengths of 160mm and cover glass thicknesses of 0.18mm.

No.	30,045	30,046	30,047	30,048	30,049
Power	5X	10X	20X	40X	60X
N.A.	0.10	0.25	0.4	0.65	0.85
Price, Ppd.	\$4.00	\$10.00	\$12.00	\$16.00	\$24.00



No. 85,056

The stereo has hundreds of applications in industry, among them are assembly, quality control, production line inspection, research.

A stereo is, in reality, two microscopes side by side... with paired objectives, eyepieces and tubes. Two images are produced and combined into one in the same manner as the eyes accomplish it in normal vision. The three dimensional effect is more apparent in the lower

No. 85,056 (illustrated at top of page) is supplied with 10X paired, wide-field eyepieces; right eyepiece focuses independently. 2.3X and 4.0X paired achromatic objec-

High-Quality American-Made Stereoscopic Microscopes

SOLD ON FREE 10-DAY TRIAL . . . FULLY GUARANTEED

ALL THESE QUALITY FEATURES

- Paired 10X, Wide-Field Eyepieces . . . Complete With Light Shields
- Paired 2.3X And 4.0X Achromatic Objectives (see table below*)
- Coated Objectives, Including Porro Prism Erecting System
- Revolving Nosepiece
- Rack And Pinion Focusing
- Interpupillary Adjustment
- Aluminum Body And Cast Iron Base
- Removable Glass Stage With Clips
- Attractive Gray, Wrinkle Finish

The stereo microscope or wide-field binocular provides binocular vision, a large field of view and true, three-dimensional, erect image. In other words, when a specimen is moved on the stage, it moves in the eyepieces in the same direction. This is not true of a laboratory microscope where the image is inverted. Scientists, educators and research personnel prefer a stereo for observing whole objects such as small animals, embryos, parasites, insects, fruits, seeds or a whole organ such as a kidney, etc. Over 80X is rarely required.

powers from 3X to 40X. Stereos have long working distances and are ideal where work has to be performed on the object under the microscope.

*STANDARD OPTICAL EQUIPMENT

Objec- tives	Working Distance	Eye- pieces	Field Diam.	Total Power
2.3X	3"	10X	.31"	23X
4.0X	2"	10X	.18"	40X

STANDARD STEREOSCOPIC MICROSCOPE

tives; rack & pinion focusing, horseshoe base, glass stage and stage clips, also heavy duty plastic cover. Instructions. Trans. Chgs. Coll. Shpg. wt. 10 lbs.

No. 85,056 \$99.50

STEREOSCOPIC MICROSCOPE WITH HEAVY-DUTY BASE AND LONG-RANGE EXTENSION ARM



No. 85,161 (illustrated at left) has the same optical equipment as No. 85,056, but is supplied with heavy base and extension arm (No. 85,040). This adds greatly to the stability and flexibility of the instrument and makes it especially suitable for industrial uses. Allows Edmund stereo microscope to swing 360° with a maximum diameter of 22" in circumference. It has an up and down excursion of 14". The combined pillar and horizontal arm fitting has locking screws for each adjustment. A circular locking collar, on the pillar, permits the arm to rotate freely. A hinged joint at the end of the arm accepts the microscope focusing post. It can be locked in any comfortable viewing position. Heavy-weight cast-iron base, chrome plated steel pillar and arm assure a steady support for vibration-free images. Base is finished in gray wrinkle enamel. Shpg. wt. 46 lbs. Trans. Chgs. Coll.

No. 85,161 \$134.00

Heavy-duty base with long-range extension arm only. Shipping weight 42 pounds.

No. 85,040 \$34.50 Transportation Charges Collect

ACCESSORY OPTICAL EQUIPMENT FOR STEREOS ABOVE

Paired W.F. With Ob- Eyepieces jectives	Total Mag.	Field Diam.	Stock No.	Price per Pair, Ppd.
10X	2.3X 23X 4.0X 40X	.31" .18"	30,214	\$19.50
6X	2.3X 14X 4.0X 24X	.38" .22"	30,213	19.50
12X	2.3X 28X 4.0X 48X	.32" .19"	30,215	19.50
20X	2.3X 46X 4.0X 80X	.22" .13"	30,217	22.50

LOW POWER ATTACHMENT FOR STEREO

Get lower powers and wider fields of view with any Edmund stereo microscope. Holder similar to attachment illustrated at right. Lens mount can be moved in or out of the field of view. Maintains stereoscopic effect. You can vary the power by raising or lowering the holder rod. **No. 30,276 \$7.50 Postpaid**

SPECIFICATION WITH 10X EYEPIECES

With Obj.	Magnification	Field Diam.
2.3X	6X-13X	1.50"-.69"
4.0X	10X-22X	1.00"-.34"

DIRECT MEASURING RETICLE ATTACHMENT FOR EDMUND STEREO MICROSCOPES

Designed for Edmund Stereo's, but can be adapted to any low-power microscope. Useful accessory for linear, geological sand, aerial photo. measurements. Unit, consisting of reticle holder, arm and 6" pillar, inserts into predrilled hole in body arm casting. Locking screw holds it vertically. Reticle holder, with locking screw, swings in or out of field of view. It accepts any of the eleven 27mm diam. reticles illustrated and listed on pages 75, 76. Instructions included. Measuring attachment, without reticle.



No. 41,057 \$4.50 Ppd.

These Edmund reticles and stage micrometers, listed below, are made for us, in England, by a special process. The excellent quality image is produced on the glass surface and protected with a thin glass cover, (quite suitable for use with oil immersion objectives). Eyepiece reticles include retaining ring.

The following 6 reticle scales, each mounted on 1" x 3" standard glass slides, are protected with a cover glass.

Stock No.	Description of Pattern	Price, Ppd.
1000000	1000000	1000000
1000000	1000000	1000000
1000000	1000000	1000000
1000000	1000000	1000000
1000000	1000000	1000000

Stock No.	Description of Pattern	Price, Ppd.
30,133	10 millimeter scale in 100 parts	\$9.25
30,085	5 millimeter scale in 100 parts	9.25
30,476	2mm and .1" in 200 parts 2 scales	14.00
30,088	1mm square in a 100 part grid, numbered horizontally, lettered vertically	9.25
30,036	1 millimeter scale in 100 parts	7.50
30,593	0.1 millimeter scale in 50 parts	24.50
30,086	0.1" scale in 100 parts	9.25
30,592	0.005" scale in 50 parts	24.50

Stock No.	Description of Pattern	Price, Ppd.
30,101	With 0.1" scale in 100 parts	\$9.25
30,110	With 0.5" scale in 100 parts	8.50
30,114	With 0.25" horizontal scale, 100 parts	8.50
30,150	With 0.5" crossline scale, 100 parts	8.50

Reticles are discs on which various patterns are engraved, etched or photographed. They are used in astronomical finder telescopes, transits, alidades, microscopes, comparators, projection galvanometers, spectroscopes and collimators. These reticles are 3mm. thick. Comparable commercial reticles cost from \$3.00 to \$10.00.




No.	Pattern	Diam., Mms.	Price, Ppd.
2046	Figure A	15.5	\$1.00
2111	Figure C	17	1.00
2176	Figure A	17.5	1.25
2174	Figure A	20	2.00
2175	Figure A	21	2.00
2118	A; PC lens, F. L. 136mm	21	1.00
2036	Figure A	29	1.00
40,160	A; in 1½" O.D. illuminable cell	29	2.50
2181	Figure A	42	1.00
2170	A; one line open at center	27	1.00
2178	Figure B	25	1.00

Figure 1 displays 15 different test patterns used for camera calibration. The patterns are arranged in a grid-like fashion. The top row includes a vertical ruler (1), a circular grid (2), a horizontal ruler (3), a circular grid with a central cross (4), a square grid (5), and a circular grid with a central cross (6). The middle row includes a circular grid (7), a circular grid with a central cross (8), a crosshair pattern (9), a square grid (10), and a circular grid with a central cross (11). The bottom row includes a circular grid (12), a circular grid with a central cross (13), a crosshair pattern (14), a square grid (15), and a circular grid with a central cross (16). Each pattern is labeled with a number in the top right corner.

Stock No.	Description of Pattern	Price, Ppd.
30,112	5mm horizontal scale in 50 parts	\$8.50
30,081	1mm horizontal scale in 100 parts	8.50
30,068	5mm horizontal scale in 100 parts	8.50
30,139	2mm horizontal scale in 100 parts	9.25
30,066	10mm horizontal scale in 100 parts	8.50
30,067	10mm vertical scale in 100 parts	8.50
30,072	0.25mm squares inside 10mm diam. circle; each 10th line is heavier	8.50
30,073	0.5mm squares over entire field	8.50
30,111	1mm squares over entire field	8.50
30,076	Crossline scales; 5mm in 100 parts	8.50
30,075	Crossline scales; 10mm in 100 parts	8.50
30,069	Crosslines; horizontal crossline is 10mm scale divided into 100 parts	8.50
30,070	Crosslines; standard rulings	8.50
30,071	Crosslines; fine rulings	8.50
30,077	Concentric circles; 0.5mm to 12mm	8.50
30,078	Concentric circles; $\frac{1}{64}$ " to $\frac{3}{8}$ "	8.50
30,079	Protractor	8.50
30,083	Patterson globe and circle (illus.)	9.25
30,084	Porton reticle (illustrated)	9.25
30,270	Fairs type No. 3	9.25

This special, small-diameter reticle is 1.5mm thick.
 1/2" divided into 100 parts **No. 30,149 \$8.50 Ppd.**



Use this 3" x 4" film for critical measurements with all kinds of optical instruments. Can be used as is or mounted between flat glass (see page 93). Each scale and reticle appears in both positive and negative form as illustrated. Film includes 2" scale with divisions every 1/10", 5cm scale with mm divisions, lines and dots in the following increments: .002", .004", .006", .008", .010", .015" and .020". Also the following reticles . . . 16 mm diam. circle with center dot and horizontal and vertical lines, concentric circles with the largest 16 mm in diam., and a 15 mm diam. crosshair.

No. 30.403 \$1.50 Postpaid

Mount these in a slotted ring of the desired diameter, as shown in the diagram. Simply solder wire in slots. Approximately 24" long.

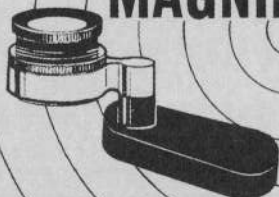
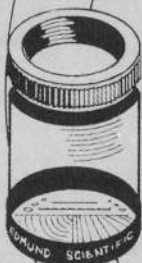


No. 40,162 Thick. .001" 65c Postpaid
No. 40,163 Thick. .0007" 65c Postpaid

Separation 1/4". Pkg. of 6. No. P-40,141 50c Ppd

Be sure to see our Comparator Reticles described and illustrated on pages 74-7

- READING CLASSES
- POCKET TYPES
- LINEN TESTERS
- EYE LOUPES
- COMPARATORS



MAGNIFIERS

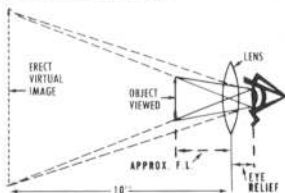
ABOUT MAGNIFIERS AND THEIR CHARACTERISTICS

Magnifiers have hundreds of applications. Industry uses them for production line inspection, reading small scales, examining surfaces, etc. They are equally important to hobbyists. What stamp or coin collector could be without one? In schools, magnifiers extend the range of vision and help to explain many phenomena of science and nature. Many types of magnifiers have been evolved for special uses—the watchmaker's loupe, fingerprint magnifier, linen tester, PRE-COP-TIC (for graphic arts) to name a few. All magnifiers are governed by the laws of optics. It is absolutely impossible to have a large diameter magnifier of high power, wide field of view and long working distance. Edmund's selection of magnifiers is one of the largest available anywhere.



THE POWER OF A MAGNIFIER (Divide F. L. into 10")

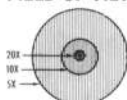
The illustration shows your eye looking at a close object. Ten inches is assumed to be as close as you can focus for comfortable vision. Now, if you assume 10" to be normal vision, an object 1" from your eye would be 10 times closer and seem 10 times larger . . . if you could see it! The function of the magnifier is to make this close view possible. Since a 1" focal length lens brings clear vision down to 1" from the eye, an object at this distance is clearly seen and appears to be 10 times larger than when viewed 10" away. Such a magnifier is commonly called 10X or 10 power. To find the power of any magnifier simply divide the focal length (F. L.) into 10", or if working with millimeters, into 254mm.



DIAMETER OF A MAGNIFIER

Usually, magnifiers with larger diameters have less magnifying power. To obtain higher power you must use a lens with shorter F. L., which requires more sharply curved lens surfaces. Sharply curved lens surfaces necessarily reduce diameters which can be used. Many people ask for both high power and large diameter in a magnifier. This, even in the space age, is not practical.

FIELD OF VIEW



This is the area seen through the magnifier. As the power of a magnifier increases, its lens diameter and field of view decrease. At five power you have about a 1½" field of view . . . at ten power, about 1". In many cases, it is best to use a low power magnifier for scanning surfaces, and another one of higher power for checking questionable areas.

WORKING DISTANCE

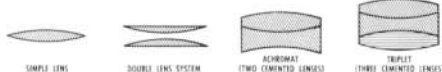
The working distance of a magnifier is the distance between the object under examination and the magnifier when the latter is in focus. A magnifier must usually be held a little closer to the object than its F. L. The working distance, therefore, is about the same as the F. L. of the magnifier. For example—

Magnification	Focal Length	Approximate Working Distance
1X	10"	10"
5X	2"	2"
10X	1"	1"
20X	½"	½"

DEPTH OF FIELD

Depth of field is the distance between the closest and farthest points at which a magnifier in a fixed position will remain in focus. It is a valuable feature when uneven surfaces are being examined. The depth of field decreases as power increases; e.g., at ten power the depth of field is approximately half that of five power.

OPTICALLY CORRECTED MAGNIFIERS HAVE MORE THAN ONE LENS ELEMENT

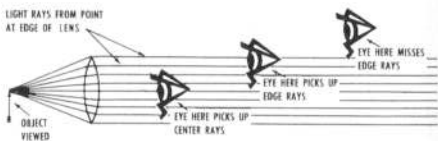


At the left are some of the basic optical systems used in magnifiers. The single lens is satisfactory for low powers. Higher powered magnifiers require two or more lens elements for good resolution and correction of chromatic or other aberrations.

HOW TO CORRECTLY USE YOUR MAGNIFIER FOR MOST COMFORTABLE VIEWING

To get best results, hold magnifier as close to the eye as possible and bring the object into focus. This eliminates light being reflected into the eye from the polished surface of the lens. Note in the illustration at the right that a close eye position receives rays through the center, while a more distant position introduces rays through the edge of the lens. Since edge rays are always the worst performers in any optical system, the close eye position is preferable. If the eye is moved still farther back from the lens, the edge rays miss the eye altogether and you cannot see the wide field which is possible with a close eye position.

The greater the distance between lens and eye, however, the greater the magnification. Thus, reading glass magnifiers used a distance from the eye give a greater



magnification than results from dividing their focal length into 10".

NOTE: For higher powers, and longer working distances at such higher powers, consider a stereoscopic microscope. These are listed on page 68.

WATCHMAKER'S EYE LOUPES & BINOCULAR MAGNIFIERS

Handiest magnifiers made for viewing and working on tiny parts, gems, mechanisms and instruments. Excellent for jewelers, hobbyists, craftsmen; for work in production, inspection, etc.



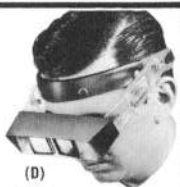
(A)



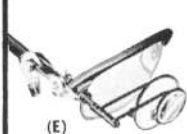
(B)



(C)



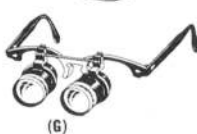
(D)



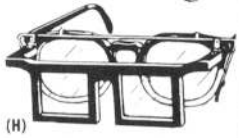
(E)



(F)



(G)



(H)

(A) WATCHMAKER'S EYE LOUPES

1" diam. lens. Easy to clean black plastic mount. Includes lightweight comfortable spring steel headband with permanent spring-back as listed below.

Working Distance	Power App.	With Headband			Without Headband		
		No.	Price	Ppd.	No.	Price	Ppd.
2 in.	5X	40,146	\$1.10		40,142	\$.70	
2 1/2 in.	4X	40,147	1.10		40,143	.70	
3 in.	3 1/4X	40,148	1.05		40,144	.65	
3 1/2 in.	2 3/4X	40,149	1.05		40,145	.65	
4 in.	2 1/2X	40,013	1.05		40,012	.65	

See Stereoscopic Microscopes listed on page 68.

(B) VARIABLE POWER EYE LOUPE

Use it complete as shown for 7 1/2X magnification. Screw off front element for 4X. Lens diams., front 3/4", back 1". Working distances 1 3/4" at 7 1/2X, 2 1/2" at 4X. Without headband.

No. 40,150 \$1.35 Postpaid

With headband.

No. 40,036 \$1.70 Postpaid

(C) WATCHMAKER'S EYE LOUPE

A double lens magnifier that can be hooked over your eyeglasses. Use both lenses for 11X, swing away front lens for 6X. Diam. of lenses 7/8" and 3/4".

No. 30,027 \$3.75 Postpaid

(D) FLIP-UP, ZOOM BINOCULAR MAGNIFIERS

A magnifier is often found deficient in use because it doesn't provide a wide enough viewing area or sufficient working distance at higher powers. These binocular magnifiers overcome such shortcomings by adjusting to any one of three ranges (1) wide angle (2) normal viewing (3) higher power. Lenses, recessed to prevent scratching, are mounted in clear lucite frame to give clear all around viewing. Removable eyeshade prevents glare. Can be worn over glasses and used with bifocals. Padded leatherette, adjustable headband for maximum comfort. Accessory 2 1/2X swing-in loupe is available for either eye.

Stock No.	Power	Working Distance Range				Price Ppd.
		1	2	3		
70,699	1 3/4X	13 1/2"	14 1/2"	15 1/2"	\$10.00	
70,698	2 1/2X	6 1/2"	7 1/2"	8 1/2"	10.00	
70,697	3X	5"	6"	—	12.00	
70,696	3 1/2X	4"	5"	—	12.00	

No. 40,736 Accessory 2 1/2X swing-in loupe. \$2.50 Ppd.

(E) SPECTACLE LOUPES WITH RIGID MOUNTING

For precision work applications. High quality lenses set in sturdy, chrome plated mounts. Arm, holding swing-away lenses, attaches securely to either wire or plastic eyeglass frames. Lenses swing up out of line of vision.

No.	Power	Lens Diam.	F.L.	Price, Ppd.
SINGLE LOUPES				
40,510	2X	24mm	5"	\$5.00
40,511	4X	24mm	2 1/2"	5.00
40,512	10X	15mm	1"	5.25
DOUBLE LOUPES				
40,513	3X, 5X	24, 20mm	3 1/2", 2"	\$7.25
40,514	5X, 10X	24, 15mm	2", 1"	7.75

(F) EYEGLASS WEARERS' CLIP-ON MONOCULARS

Long working distances make them invaluable for use in assembly of small precision parts, inspection for flaws, reading vernier scales, observing close-tolerance machining operations. Built of sturdy, lightweight metal, they weigh only 1 oz. each and clip to any frame without adding cumbersome weight. Quality achromatic, coated lenses. Wide field of view. Each approx. 2" long with 1 1/8"-diam. barrel and 1 1/2"-diam., clip-on mount. Each in its own felt-lined, black leather carrying case fits compactly in pocket or purse. May be of help as a low-vision aid.

Reading Monocular (3X) Illustrated. Focal range 12".
No. 40,720 \$14.95 Postpaid

Zoom Monocular (2.5X). Zoom focus from 38" to infinity.
No. 40,721 \$22.50 Postpaid

(G) 3X ACHROMATIC BINOCULAR LOUPE

One of the best visual aids available for the industrial worker and hobbyist. It has achromatically corrected optics, provides 3-power binocular vision and has a highly desirable working distance of approx. 10"—no need to bend over work. Weighs approx. 2 3/4 ounces, has interpupillary adjustments (45mm to 62mm) and swings up out of the line of vision when not required. Elastic safety holder included. Mounted on lensless eyeglass frame as illustrated.

No. 70,610 \$29.95 Ppd.

With clips only for attaching to eyeglass frame.

No. 70,609 \$29.95 Ppd.

With leather band.

No. 70,634 \$24.95 Ppd.

(H) TELESIGHT MAGNIFIERS FOR PERSONS WITH OR WITHOUT EYEGLASSES

For regular glasses. Fits all sizes . . . no adjustments necessary. With adjustable attaching clamp to fit all eyeglass frames. Allows magnification without loss of correction, reduces eye fatigue. Leaves both hands free for work. Swings out of way when not needed. Weighs 1 oz.

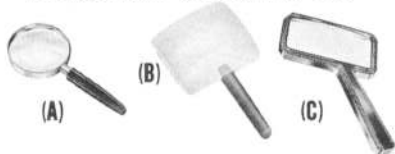
No.	Distance from Eye to Object	Power	Price Ppd.
50,240	11"	2X	\$16.00
50,241	7"	2.5X	16.00
50,242	6"	3X	16.00

For persons not wearing eyeglasses. Magnifiers as illustrated, permanently attached to good quality lensless eyeglass frames. Magnifiers swing up, out of way.

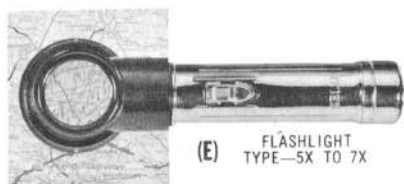
No.	Distance from Eye to Object	Power	Price Ppd.
50,243	11"	2X	\$16.75
50,244	7"	2.5X	16.75
50,245	6"	3X	16.75

MAGNIFIERS

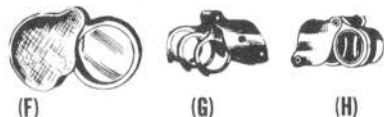
READING GLASSES—Wide view, lower power



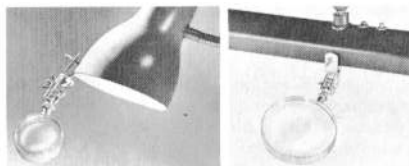
GOOSENECK—Leaves both hands free



FLASHLIGHT TYPE—5X to 7X



POCKET SIZE, 3X to 12X—Low as 50¢



CLAMP ON—For desk or workbench



FIXED BASE—Only \$2.00 Ea.



(M)

LINEN TESTERS—Excellent for printers and hobbyists of all kinds as well as for textile inspection.

(A), (B), (C) READING GLASSES

When we think of magnifiers, most of us automatically think of large reading glasses such as Sherlock Holmes used. However, a reading glass is a magnifier with a very special purpose. Because its main use is for reading wide columns of small or difficult type, it is usually of low power (around 2X) in order to give a long working distance and a wide field of view. Also, while smaller, higher powered magnifiers are used with one eye, you look through a reading glass with both eyes. Each person will use a reading glass at varying distances from eye to lens and from lens to object.

Style	Number	Diam. of Lens	Price
(A)	40,027	3"	\$2.25 Ppd.
(A)	60,353	3 1/2"	2.75 Ppd.
(A)	30,031	4"	3.50 Ppd.
(A)	60,354	4 1/2"	4.50 Ppd.
(B)	60,635	2 1/2" x 3"	1.00 Ppd.
		(Plastic Lens)	
(C)	30,021	2" x 4"	3.25 Ppd.

(D) GOOSENECK MAGNIFIER FOR INSPECTION

Low power (approx. 2X) for wide field and longer working distance. Ideal for rapid, repetitive inspections in office, factory, laboratory. Large 4" diameter glass lens in chrome plated brass mount is attached to 12" long flexible gooseneck. Ball swivel joint provides movement in any direction. Weighted metal base has gray wrinkle finish.

No. 70,241 \$7.75 Ppd.

Like above but with clamp-on base, 3" magnifier on a 24" gooseneck. Sturdy clamp opens to 1 3/4".

No. 70,235 \$8.95 Ppd.

(E) ILLUMINATING FLASHLIGHT MAGNIFIER

Use for examining fibers and textiles, signatures and seals, auto parts, taps and drills. A simple, convenient substitute for a microscope. Excellent in retouching photos. Perfect for doctors, hobbyists and philatelists. Two plano-convex lenses give flat, wide field. Enamel and chrome finish. Inch and millimeter scales engraved along side of bottom opening. Chromed battery housing, 6 3/4" long. Batteries not included.

5 Power. 50mm diam. lenses. No. 50,154 \$3.95 Ppd.

7 Power. 30mm diam. lenses. No. 50,143 \$1.95 Ppd.

10 Power. 30mm diam. lenses. No. 60,366 \$2.50 Ppd.

(F), (G), (H) FOLDING-TYPE POCKET MAGNIFIERS

Cases protect lenses, serve as handles in use. (F) 4X. A 2"-diameter double-convex lens, mounted in celluloid frame, folds into simulated leather case.

No. 40,024 50¢ Ppd.

(G) 3X, 6X and 9X. Three simple lenses, all 7/8" in diam., give good choice of magnification and field. Nicely mounted in black plastic case.

No. 40,032 \$1.25 Ppd.

(H) 8X or 12X Doublet. Two-element lens for greater power, better correction. Folds into plated metal case.

12X. With 1 1/2"-diam. lens. No. 40,028 \$1.25 Ppd.

8X. With 1"-diam. lens. No. 40,029 2.75 Ppd.

(I) ADJUSTABLE, SWIVEL CLAMP MAGNIFIERS

These large diameter magnifiers are all approximately 2 power and give a large field of view and ample working distance under the lens. Screw clamp with 3/4" clearance attaches them to electric light fixtures; two-ball swivel joint adjusts to any position. Can easily be maneuvered on fixture so you have plenty of light on the object to be examined. Excellent for desk or work bench lights. Large 4" lens is especially recommended because you can look through it with both eyes to obtain a 3 dimensional effect. Where slightly higher powers are desired, use the smaller diameter magnifiers.

No.	Diam. of Lens	Focal Length	Price, Ppd.
30,252	2"	6"	\$2.00
30,251	2 1/2"	6"	3.00
30,250	3"	5"	3.75
30,249	4"	8"	4.75

(J), (K), (L) LOW-COST, FIXED-BASE MAGNIFIERS

(J) Wide Field, 3X With Plastic Base. Field of view is 2 3/4". Uses an expensive war-surplus, precision-polished, double-convex lens (crown glass element taken from Government 7 x 50 binocular objective). Open structure of plastic base allows plenty of light to reach your work. Clear diameter of lens is 1 7/8".

No. 50,254 \$2.00 Ppd.

Artist's Reducing Glass. Similar to above, but approx. 1/2 X. Mounted in white 3"-diam., see-through plastic base. Clear lens diameter 1 7/8", F.L. 6 3/4".

No. 60,224 \$2.00 Ppd.

(K) 3X With Rubber Base. 2 1/2" high x 2 3/4" diam. Use as suction magnifier on ground glass, cameras, dials, meters. Lens is pitch polished.

No. 40,309 \$2.00 Ppd.

(L) Key-Chain Magnifier Enlarges 20 Times. Like carrying a little "microscope", weighs only 1/4 oz. This new 20-power miniature has a ground and polished glass lens mounted in brass. Amber color plastic handle. Ideal for

quick inspection of tiny parts—gems, splinters, small gears, film grain, watch movements, halftone dots, Hi-Fi needles, ground glass images for camera focus, etc. Pops into pocket or purse. Put it with your keys and it's always handy when needed. Hold close to eye and close to object. . . field of view 3/8". Approx. 1/2" x 3/8" x 1 1/8".

No. 40,797 \$2.00 Ppd.

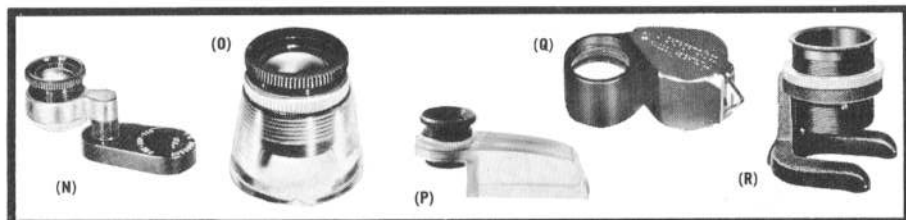
(M) LINEN TESTERS

Tops for counting threads in textiles; for examining printing, stamps, engravings; for industrial inspection. Mounts have scale on base, fold flat for easy carrying. Can be placed right on object. 5X model has achromatic (color-corrected) wide-field lens.

Power	Lens Diam.	Mount	No.	Price Ppd.
5X	1 1/8"	Brass	40,649	\$3.50
6X	1 1/4"	Aluminum	40,030	1.75
9X	1 1/2"	Aluminum	40,031	1.50

Mount Your Own Magnifiers. Choose from our thousands of war surplus and manufacturers' reject lenses. Send today for our 11-page booklet on Homemade Magnifiers.

No. 9002 20c Ppd.



HIGHLY CORRECTED ACHROMATIC MAGNIFIERS

Some of the best high powered magnifiers made. Outstanding wide angle field of view plus excellent flat field and unexcelled definition. Highly corrected, 3-element lens systems. Tops for anyone in graphic arts.

(N) Pre-Cop-Tic Swing Base Magnifier. Most popular one in graphic arts field for examining half-tone dots. Focal length, 9X is 1 1/8", 12X is 1 3/4", field of view, 9X is 1", 12X is 3/4". Diam. of lens 1 1/8".

No. 30,009 (9X) \$8.50 Postpaid

No. 30,010 (12X) \$10.00 Postpaid

(O) Pre-Cop-Tic Clear or Opaque Base. Same lens systems as above. Choice of clear plastic base (admits light) or opaque base (for internally lighted specimen). The latter is extremely useful for negative stripping work or in focusing image on camera ground glass.

No.	Power	Base	Price Ppd.
30,057	9X	Clear	\$8.50
30,055	12X	Clear	10.00
30,056	9X	Opaque	8.50
30,054	12X	Opaque	10.00

(P) Pre-Cop-Tic with Plastic Handle. Same lens systems as above. Clear plastic handle popular with etchers. . . resists acids, will not block light. Measures 1" high x 1 3/8" wide x 3 1/2" long.

No. 30,223 (12X) \$11.50 Ppd.

No. 30,224 (9X) \$10.00 Ppd.

2X COIN INSPECTOR ILLUMINATES & FLIPS COIN

A must for all coin collectors. Has illuminated 2X magnifier. Manual control bar moves coin from hopper to magnifier and flips it for reverse-side examination. Returning control bar to starting point ejects coin. Unit, with accessory hopper, handles coin sizes from dime to quarter. Includes bulb and 6 ft. cord with plug, 3 3/4" wide x 5" high x 7 1/2" long. Weighs 1 1/2 oz.

No. 70,611 \$12.50 Postpaid



(Q) 10X Hastings Triplet Pocket Magnifier. The most favored pocket magnifier with highly corrected, cemented triplet lens system. Used by jewelers, gem collectors, engravers, machinists, etc. Flat field. . . no distortion, no color fringes. Sturdily mounted in black anodized aluminum cell. Cell swings into chrome plated pocket case for protection. Has place to attach chain. Diam. of lens 1 1/2"; clear lens diam. 3/8". Field of view 3/8". Size when closed 3/4" x 1 1/4".

No. 30,344 \$6.50 Postpaid



10X Hastings Triplet Lens, Unmounted. Identical optical system to No. 30,344, but without mount. This cemented triplet magnifier is color corrected, has flat field of view, and measures 15/32" (15mm.) in diam. Frequently purchased in quantities for installation on manufactured products. . . an excellent magnifier for reading vernier scales, etc.

No. 30,120 \$3.75 Ppd.

(R) Wide Field Utility Magnifier. Achromatic lenses, rugged construction, aluminum body, wide, sturdy base. Ring lock sets focus for repeated use. Neoprene gaskets seal lens system against moisture and dust. Excellent clarity and sharpness right out to edge of field, 5X has 3-element lens system, 6 1/2X has 4 elements. Both excellent buys in quality magnifiers. Lens diam. 1 3/8". 5X, Field of View 1 1/4".

No. 732 \$12.95 Ppd.

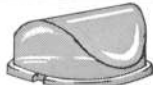
6 1/2X, Field of View 1 1/8". Recommended for viewing microfilm up to 1/2 frame 35mm size.

No. 733 \$15.95 Ppd.

54MM DIAM. CIRCULAR, GLASS CYLINDER-LENS

Has unusual properties. Place flat side on work to magnify (approx. 2X) and compress image. Turn 90° to expand it. Excellent for reading scales and experimentation. 20mm thick, 60mm F.L. Base, including 3mm lip, measures 60mm overall.

No. 41,050 \$1.00 Postpaid

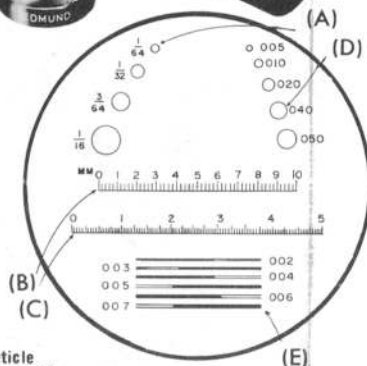


MEASURING MAGNIFIERS

EDMUND'S PRECISION OPTICS

6X JUNIOR SIZE COMPARATOR MEASURES TO .005"

COMPLETE WITH RETICLE, CASE \$12.50 Ppd.



Reticle
No. 30,186

FULL 6-POWER MAGNIFICATION

The Edscorp Junior Comparator is smaller than the one illustrated at right. This model is easy to carry in your pocket or tool chest, because it only measures 1 3/4" high x 1" O.D. It has an etched glass reticle instead of a film reticle found on many other pocket comparators. This insures accuracy, because glass will not bend or warp. Neither is it damaged by oils or solvents. The reticle pattern is filled with pigment which makes it easy to read under magnification.

This optical measuring tool gives a true reading because it does not require adjustments which bear on the surface measured.

A special feature of the reticle is the thickness comparison scale (E). A series of parallel lines .002" to .007" apart make it possible to measure visually and directly the thickness of materials such as paper, plastic, gaps between mechanical parts, etc. Mechanical measurements of such items are sometimes inaccurate because the materials are apt to compress.

The linear scale is given both in millimeters (B) and in decimal inches (C). The 10mm long metric scale is divided into units of .2mm. The .5" decimal-inch scale is divided into units of .005". The scales to compare hole diameters read in fractions from 1/64" to 1/16" (A), and in decimals from .005" to .050" (D).

Both the reticle and the object to be measured are magnified 6 times. The optical lens system is accurate to the edge of the field. Cell of transparent Lucite admits plenty of light to reticle and work. Illuminator No. 50,076 can also be used with it. The magnifier can be focused and locked to suit individual users. Complete with genuine leather case.

No. 30,169 \$12.50 Ppd.

Reticle Only. As described and illustrated above. 21mm diam. Can be used in standard microscopes.

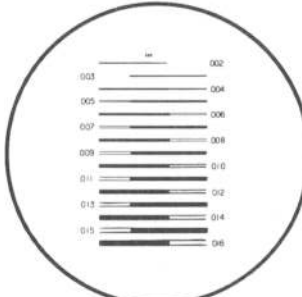
No. 30,186 \$6.50 Ppd.



- 3 element, cemented triplet.
- Unusually flat field.
- Large choice of reticles.
- Focusing adjustment with lock.
- Leather pocket case.

The Edscorp Pocket Comparator has found hundreds of uses and applications in industry, in the laboratory and at the workbench. Instantly ready for use, it requires no time-consuming adjustments. Ideal for checking small parts, small linear measurements, angles, hole diameters, thread sizes, etc. Special reticles are listed for geological sand measuring, metrology, aerial photography and graphic arts work.

The 6X, with triplet lens, (lower priced comparators usually have only one lens)



Reticle No. 30,587; fifteen line widths in increments of .001"; .002, .003, .004, .005, .006, .007, .008, .009, .010, .011, .012, .013, .014, .015, .016 inches. (27mm diam.)

\$6.75 Ppd.

6X EDS



provides a flat area, assuring light is admitted to cell walls (in 50,076 Illuminator size, 2" high x 1" any location. Ac diam., etched, and individually page 76.

Comparator Magn not included).

No. 30,

Above Comparat with Reticle (No

No. 41,



Reticle No. (metric). 04 0.15, 0.2, 0. diam.)

EDMUND SCIENTIFIC CO. POCKET-COMPARATORS

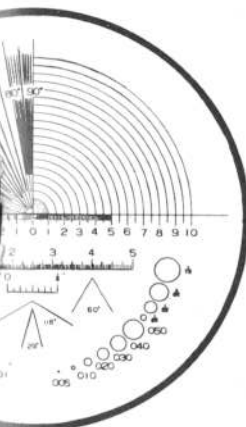
CORP POCKET COMPARATOR ...

CHOICE OF 11 DIFFERENT RETICLES

These precision reticles are etched on glass, pigment filled and won't warp. They cover most industrial applications including the graphic arts. Reticles for geological sand measurements and aerial photography are also available and listed on page 76.

Reticle No. 30,585; 90° scale lines 1/10° between 80° & 90°. 22mm horiz. scale (left 0 to 5mm in 1/10mm; right 0 to 1mm in 1/20mm). 1mm to 5mm graduated in 1/10 mm 1/2° horiz. scale, graduated in .005", numbered each 1/100". 1/8° horiz. scale, graduated in 1/4°. Circles, metric 1/10 to 1mm. Circles inch, .005" to 1/4". Degree scales 29°, 55°, 60°, 118°. (27mm diam.)

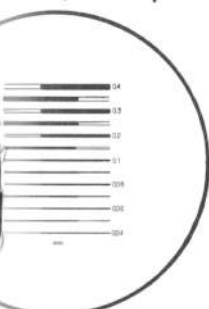
\$6.75 Ppd.



field over entire reticle accurate measurements. through the clear plas-dark areas use our No. listed below). Pocket-4" diam, handy for on-and easily portable to epts all of the 27mm. s reticles illustrated escribed, also those on

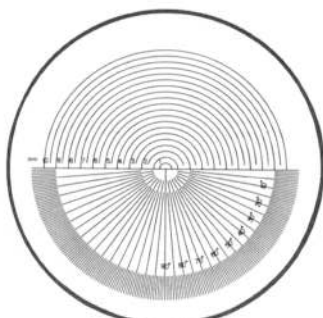
fier with case (reticle
\$325 \$12.75 Ppd.

r Magnifier, complete
(30,585), leather case,
\$55 \$19.50 Ppd.



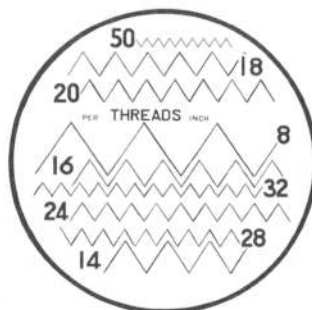
0,586; thirteen line widths
.05, .06, .07, .08, .09, 0.1,
25, 0.3, 0.35, 0.4mm. (27mm

\$6.75 Ppd.



Reticle No. 30,589; 180° radius, 10mm scale (left) numbered each mm., radii each 1/2mm 180° scale numbered each 10°, graduated each degree. (27mm diam.)

\$6.75 Ppd.

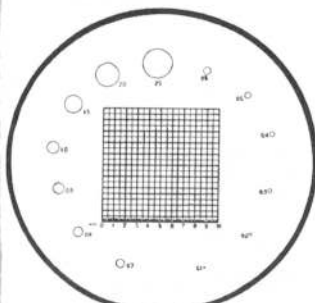


Reticle No. 30,591; nine (inch) screw threads shown in TPI, 50, 32, 28, 26, 24, 18, 16, 14, 8. (27mm diam.)

\$6.75 Ppd.

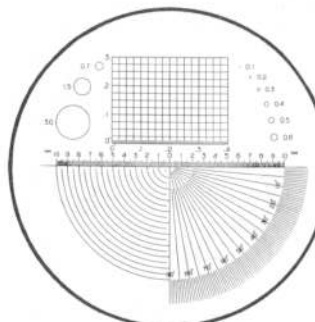
Reticle No. 30,590 (not illust.); nine metric screw threads, 0.25, 0.3, 0.35, 0.4, 0.45, 0.6, 0.75, 0.9, 1.00mm. (27mm diam.)

\$6.75 Ppd.



Reticle No. 30,588; 10mm square divided into 1/2mm squares. 10mm scale in 100 parts. 13 circles, 1mm to 2 1/2mm. (27mm diam.)

\$6.75 Ppd.



Reticle No. 30,584; .3" x .4" rectangles in .025" squares. Horiz. scales .4" long graduated .005", and 20mm. long graduated in 200 parts. 90° scale numbered, each 10°, lines at 5°. Millimeter radius scale numbered each 10°, graduated each degree. 9 circles, 1/10mm to 3mm diam. (27mm diam.)

\$6.75 Ppd.

ILLUMINATOR FOR COMPARATORS ILLUSTRATED ABOVE

ellent for use inside machinery, in dark corners, etc. Battery-operated light minates both the comparator reticle and the work being checked. Accepts pocket comparator with outside diameters from 7/16" up to 1 1/16". Uses standard light batteries (included). Bright chrome finish. Measures 7 1/2" long overall. with batteries only 4 oz.

No. 50,076 \$7.95 Postpaid

NOTE: All of the 27mm diam. reticles, on pages 74, 75, and 76, can be used with Edmund Stereo Microscopes. See Measuring Microscopes listed on pages 62, 65, 66, 68.

MEASURING MAGNIFIERS

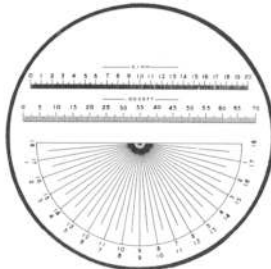
MORE RETICLES FOR NO. 30,325 COMPARATOR



Reticle No. 30,539; Graphic Arts, scale 48 pts. by $\frac{1}{2}$ pts., linear scale $1/100''$ to $1/200''$, 12 half-tones 50 to 200 screen, $\frac{1}{4}$, $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, 3, 5, 6 point blanks. 27mm. diam. **\$6.75 Ppd.**

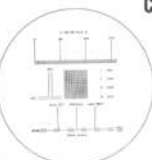


Reticle No. 30,174; Geological Sand 10mm. grid scale, numbered every mm., with 2mm grid ruled in .2mm squares. Includes $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{2}$, 1, 21 and 4mm. circles, for grain size measurements. 27mm. diam. **\$6.75 Ppd.**



Reticle No. 30,461. Aerial Photography 20mm. scale graduated each $1/10mm.$, numbered 0 to 20. Foot scale graduated .0005" and .008", numbered 0, 5, 10 to 70. Compass rise calibrated each 5°, numbered 1 to 18 left to right and right to left. 27mm. diam. **\$6.75 Ppd.**

MAGNETIC INK COMPARATOR



MAGNIFIES 12 TIMES . . . WITH REVISED E-13 B2 RETICLE COMPARE CHECKS AGAINST AMERICAN BANKING ASSN. TOLERANCES

This comparator is an important tool in the greatly expanding field of magnetic ink printing.

Every bank, check printer or magnetic code user will find this instrument ideal for "go," "no-go" measurements. Its small size, $1\frac{1}{4}''$ high x $1\frac{1}{4}''$ diam. makes it convenient for pressmen and others to carry.

Reticle as illustrated enables user to check character skew, width, coverage, voids, etc. against American Banking Association tolerances.

Reticle Only. Without Comparator.

No. 30,285 \$24.00 Postpaid

No. 30,284 \$10.80 Postpaid

12X Magnifier, as above, with 27mm. diam. reticle adapter.

No. 30,177 \$13.20 Postpaid

Note: For greater magnification all 27mm. diam. reticles for Comparator No. 30,325 can be used, however only center portion of field (13mm. diam.) is visible.

12X Magnifier with 21mm diam. comparator reticle adapter.

No. 30,178 \$12.10 Postpaid

6X GRAPHIC ARTS COMPARATOR FOR TYPE, SPACING, SCREENS

One linear scale measures to 48 points by $\frac{1}{2}$ point. Another, $\frac{1}{2}''$ long, measures by $1/100''$ or $1/200''$. Twelve scales measure halftones from 50 to 200 lpi. Also $\frac{1}{4}$, $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, 3, 5 and 6-point blanks. Etched and filled glass reticle, 27mm diam. Clear plastic body, single element lens, focusing threads with lock. $1\frac{3}{4}''$ high.

No. 30,551 \$15.00 Ppd. / Reticle only. No. 30,539 \$6.75 Ppd.



Pre-Cop-Tic Magnifiers with opaque bases for negative stripping, focusing on camera ground glass, etc.,
No. 30,056 and 30,054 page 73.

GET IT TODAY! "FUN WITH OPTICS" PROJECT BOOK



Step-by-step, illustrated instructions on building all the following optical instruments . . . inexpensively

- Telescopes
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Cram packed with exciting fun . . . only 50¢

What an amazing treasurehouse of practical information. Dozens of optical projects . . . each carefully worked out, fully described and simply diagramed. 32 pages, each measuring $8\frac{1}{2}''$ x $11''$. Interesting projects for the photographer, artist, astronomer, zoologist, botanist, biologist . . . projects useful to almost any science-minded hobbyist.

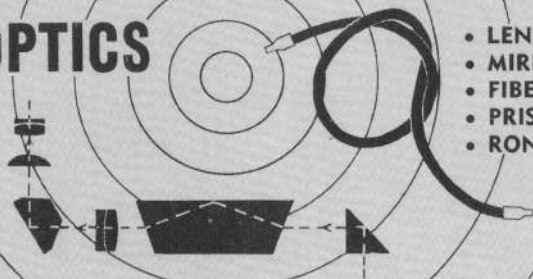
One of the most practical optical manuals available. So simply and plainly written that any one can easily follow the instructions. Includes a primer section on lenses, prisms and optical parts. Build the instruments described at a small fraction of their normal retail price. Edmund can furnish, at low cost, the lenses, prisms and parts you will need.

See pages 77 to 95 for optical parts.

No. 9050 Only 50c Postpaid



OPTICS



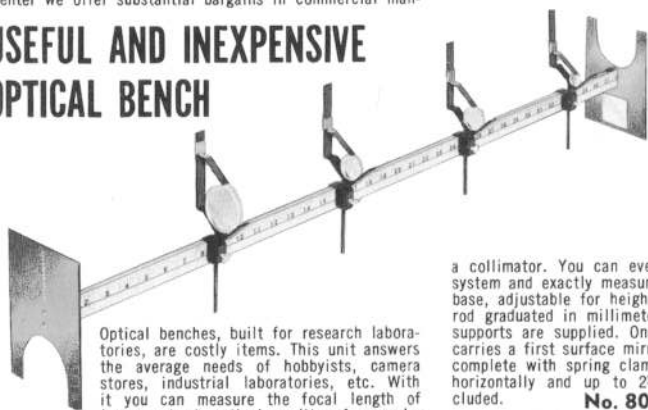
- LENSES
- MIRRORS
- FIBER OPTICS
- PRISMS & OPTICAL PARTS
- RONCHI RULINGS

OPTICAL HEADQUARTERS U. S. A.-ALL ITEMS IN STOCK

Edmund Scientific Co. carries more lenses, prisms, mirrors, and miscellaneous optical items in stock than any other company in the world. From previous purchases we still have on hand large quantities of war surplus lenses, prisms, optical systems, and other optical items. These are offered to you at a fraction of their original cost. Choice imports from Japan and Germany plus U.S. commercially made optical items are listed. For the experimenter we offer substantial bargains in commercial man-

ufacturers' rejects (slight chips, etc.) Edmund supplies optical parts to practically all of the colleges and universities in the U.S.A. Research laboratories of many major companies are customers of ours. The standing order in many organizations is "CHECK THE EDMUND CATALOG FIRST BEFORE YOU SPEND A LOT OF TIME AND MONEY HAVING IT MADE". This, coupled with our prompt service, saves you both time and money.

USEFUL AND INEXPENSIVE OPTICAL BENCH



Optical benches, built for research laboratories, are costly items. This unit answers the average needs of hobbyists, camera stores, industrial laboratories, etc. With it you can measure the focal length of lenses, check optical quality of one element or a complete system against test charts. Check the image quality of a projection lens. Use the bench as

Only
\$14.95 Ppd.

a collimator. You can even position lens elements in a system and exactly measure size of spacers required. The base, adjustable for height, is a 40" (1 meter) hardwood rod graduated in millimeters and inches. Two metal end supports are supplied. One is a reticle plate, the other carries a first surface mirror. Four V-shaped lens holders, complete with spring clamp and thumb lock nuts, adjust horizontally and up to 2 1/4" vertically. Instructions included.

No. 80,064 \$14.95 Postpaid

Extra lens holder complete with spring clamp.

No. 60,069 \$2.50 Postpaid

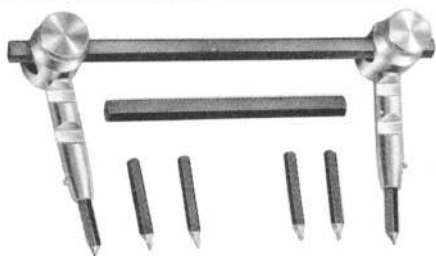
NEW EDMUND SPANNER WRENCH

REMOVES RETAINING RINGS QUICKLY, WITHOUT RISK OF DAMAGING COSTLY EQUIPMENT

- Vital Tool for work with optical instruments, cameras, telescopes, etc.
- Fully adjustable for 1/2" to 7"—diameter retaining rings ... even greater diameter-rings with longer bars.
- Hex-bodied tips slip into hex-hollowed arms and lock securely with set screws ... WILL NOT ROTATE.

Aluminum bodies with locking knobs hold aluminum arms in vise-like grip against bar. Adjustable legs extend tips from 1 1/2" to 3" below spanner wrench body. Wrench includes two hex bars of high-tensile steel, 3 1/2" length and 7" length (3/4" across flats). Three pairs of general purpose tips provided: two .025" thick flat tips, two .062" thick flat tips, and two .062"-diam. pin-type tips.

No. 70,751 \$12.50 Postpaid



DIAL-READING METRIC CALIPER



Much easier and faster to use than regular calipers or micrometers. Dial graduated 0 to 10mm in 0.1mm divisions. Beam scale graduated 9 to 100mm in 10mm divisions. Maximum measuring capacity is 0 to 105mm (outside); 5 to 110mm (inside). Completely rustproof, stainless steel, satin chrome finish. Leather case. Imported.

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DIOPTER GAGE MEASURES LENS CURVATURES

A precision instrument for measuring lens curvatures, selecting blanks or grinding lenses. Reads 0 to ± 17 diopters in 1/4-diopter increments. With directions for computing F.L. on all 6 types of spherical lenses, plus diopter-to-mm conversion table for crown and flint glass.



No. 40,411 \$20.00 Ppd.

OPTICS - ACHROMATIC LENSES

LENS CLEANING SUPPLIES



(A) BEST YET . . . SILICONE CLOTH

These are non-woven, all rayon cloths, combined with miraculous silicones. They can be used with even the finest coated optics for easy, safe, fast cleaning. Soft and free of impurities they will not scratch. When required, they may be washed and reused. Excellent for all-around use. In addition to optical laboratory use, they are excellent for scratch free polishing of plastic, polishing bright metal, leather, wood or glass surfaces, dusting photographic film or first surface mirrors. Each measures approx. 16" x 18".

Package of 3. **No. P-60,059 \$1.00 Postpaid**

Package of 100. **No. P-70,137 \$26.50 Postpaid**

(B) LENS CLEANING TISSUE—FIRST QUALITY

This clean soft paper is made especially for cleaning lenses and objectives on microscopes, telescopes, binoculars and other optical instruments. Does not readily collect dust or grease and is free from impurities. Will not scratch the polish of the lens. Low in cost, yet the very same lens tissue used at important army optical manufacturing and maintenance shops. Meets Government Specifications UU-P-313C.

500 sheets (7 3/4" x 10 3/4").

No. P-736 \$2.80 Ppd.

500 sheets (7 3/4" x 3 1/2").

No. P-60,375 \$1.00 Ppd.



(C) LENS BRUSH **No. 40,504 \$1.15 Ppd.**

(D) CLEANER-SOLVENT DISPENSER

Quickly pays for itself. One-hand operation takes less than 1 second. Press down on stainless-steel disk-top with applicator and the required amount of liquid rises from the 8 oz. poly-bottle. Air-tight check valve prevents fumes, spilling, and dripping. Eliminates evaporation, accidents and waste.

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(E) SCRATCH REMOVER—POLISH FOR PLASTIC

Effective new scratch remover reduces replacement costs by restoring a clear, transparent face to plastic.

Separately applied scratch remover and polish produce visual clarity impossible with former one-step methods. Handy in your home workshop for rejuvenating dozens of plastic items. 2-ounce jar of scratch remover and 7-ounce jar of polish. Non-toxic, non-flammable liquids that may be applied by hand or machine.

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CLEANER-PROTECTOR FOR LENSES, PLASTIC

Removes grease, dirt without harm. Makes water repellent.

No. 40,382 (8-oz.) \$1.00 Ppd.

No. 85,102 (1 gal.) \$10.80

Trans. Chgs. Coll.

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H. J. Habell and A. Cox

A worthwhile contribution for the engineer concerned with the use of optical instruments in engineering practice. Chapters on principles and theory, microscopes, telescopes, optical measuring, etc. 411 pages. (6" x 8 3/4").

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No. 9300 \$2.00 Postpaid

SPLIT RETAINING RINGS FOR MOUNTING LENSES



Custom-designed, square-cross-section provides far greater bearing surface. Made of special carbon steel. 4 each: .618" O.D. x .035" sq.; .878" O.D. x .039" sq.; 1.136" O.D. x .055" sq.; 1.400" O.D. x .062" sq.; 1.665" O.D. x .071" sq.

No. 60,207 \$1.25 Ppd.

LINEAR ZONE PLATES IN 35MM SLIDE MOUNTS

For demonstration or testing optical instruments, use as monochromators, non-focusing theodolites, filters to measure light output. Create moiré patterns, special effects camera stops, etc. You get one with 83mm F.L., another with 56mm F.L. at 5460 Å. u. wave length. Also manual by Clifford Miles. 10 experiments cover focusing, aberration, "f" number, astigmatism, moiré patterns, etc. Section on applications. 28 pages (8 1/2" x 11").

Manual and Plates.

No. 60,463 \$3.00 Ppd.

83mm Plate only.

No. 30,549 \$1.00 Ppd.

56mm Plate only.

No. 30,550 \$1.00 Ppd.

LENS CEMENT BONDS AT ROOM TEMPERATURES!



This outstanding polyester resin bonds lens elements within 3 hours . . . without heat! Far superior to Canada Balsam. Refractive index (nD) —1.529 at 25° C. Conforms to Fed. Spec. MIL-A-003920A (Ord) for MI-10-2A cement.

Withstands temperatures of —65° to +160° F. One bottle cement and one bottle catalyst.

One set, 3-cc size.

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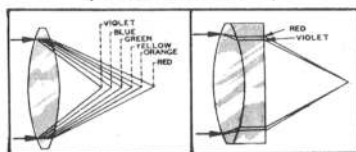
One set, 2-oz. size.

No. 60,506 \$8.00 Ppd.

"YOUR CAREER IN OPTICS"

Sincerely interested in optics as a career? Written for age 14 and up, this 24 page, illustrated book is most helpful. For free copy, write Optical Soc. Of America, 1155 16th St., Washington, D.C. 20036.

ACHROMATIC LENSES (Color Corrected)



From the illustration you will note that a single element lens focuses the various colored rays at different points. However, this may be corrected, as shown in the second illustration, by making a compound lens using flint glass for one element and crown glass for the other. These two elements are usually cemented together. A compound lens is usually also designed to correct for certain other aberrations. Thus, they are much superior to simple lenses.

Important note: Since many of our lens listings cover surplus items, our stocks are constantly changing. Because of this, we suggest that you specify an alternate. If the lens you order is no longer available, we will send you the closest substitute unless you state otherwise.



All our achromats, unless otherwise indicated under "Notes" are Type B which is the type generally used for most instruments. When

ordering, please list Stock No. and price. If you include diameters and focal lengths please use millimeter figures. For your convenience a helpful table, showing millimeters and equivalent fractions in inches, will be found on page 97 and scale on page 147.

No.	Price	Diam. Mm.	F.L. Mm.	Notes
6390	\$2.25	7	12	
6391	1.75	4	16	
6387	2.25	12	17	
6388	2.00	8	18	
6384	2.00	9	20	Ctd.

6383	2.00	9	22	Ctd.
6389	2.00	10	22	
6386	2.00	10	25	
30,120	3.75	15	25	Triplet
6382	1.75	9	28	

30,474	2.25	19	28	Ctd.
30,496	2.25	11	29	Ctd.
5148	2.00	18	29	
5131	3.20	18	29	Ctd.
6238	3.25	13	30	

30,472	2.00	18	32	
6264	2.50	10	35	Mtd. Trip.
5218	3.00	16	35	
5206	3.50	16	35	Ctd.
30,567	2.50	16	35	C, Ctd.

5120	2.25	18	36	
5186	2.75	18	36	Ctd.
6381	1.60	13	37	A
6380	2.10	13	37	A, Ctd.
30,565	2.25	13	38	Ctd.

6191	2.00	18	38	
6358	2.00	18	39	Ctd.
40,634	2.25	14	41	Mtd.
6393	1.50	10	42	Ctd.
6376	1.40	16	43	A

6377	1.90	16	43	A, Ctd.
30,229	6.50	23	43	Triplet
40,807	2.25	20	44	A, Mtd.
6425	2.50	21	44	Ctd.
30,583	4.00	15	46	Ctd.

30,497	2.25	17	46	Ctd.
6335	2.50	28	47	
6218	2.50	13	49	Ctd.
6362	2.50	17	49	A
6186	1.50	18	49	

6226	2.00	18	49	Ctd.
30,103	2.25	18	49	Mtd.
30,102	2.75	18	49	Mtd., Ctd.
6293	2.25	20	49	Mtd.
6394	1.50	10	50	Ctd.

No.	Price	Diam. Mm.	F.L. Mm.	Notes
40,172	\$1.25	18	50	Mtd. ‡
6397	1.75	23	50	
6398	2.25	23	50	Ctd.
6299	1.00	13	51	C
40,577	1.50	19	51	

6400	2.00	27	53	
6322	1.50	15	54	A
30,562	2.25	10	55	Ctd.
6360	2.50	17	55	A
6294	2.00	20	55	

6292	2.00	22	55	Mtd.
6401	2.25	23	55	Ctd.
6307	2.00	29	55	
6166	2.50	29	55	Ctd.
30,571	2.50	16	57	Ctd.

6274	1.75	22	57	
6402	1.75	17	58	A
6189	2.00	14	60	
6403	2.25	17	60	A, Ctd.
30,556	2.50	21	60	

6246	3.25	39	63	Ctd.
6361	2.50	17	65	
30,471	2.00	22	66	
6355	2.50	28	66	
6317	2.50	30	66	A, Ctd.

6254	2.00	34	66	
6215	2.50	34	66	Ctd.
6266	1.75	19	67	
30,570	2.00	21	67	Ctd.
40,892	2.75	30	67	Ctd.

30,490	2.00	23	68	Ctd.
30,489	2.00	22	74	Ctd.
40,580	2.25	34	74	
30,473	2.25	18	75	
30,566	2.50	27	75	Ctd.

6341	1.75	23	77	Ctd.
6168	1.75	29	77	A
6017	1.00	12	80	
6405	2.25	37	82	A

40,631	2.75	35	83	A
40,884	2.50	25	85	Ctd.
6325	2.00	30	87	C
6408	2.75	36	87	Ctd.
30,486	2.00	14	88	C, Ctd.

No.	Price	Diam. Mm.	F.L. Mm.	Notes
6308	\$1.75	33	90	A
6407	2.25	33	90	A, Ctd.
6279	1.00	16	92	C
6190	1.75	26	93	Ctd.
30,480	2.00	21	95	Mtd., Ctd.

6187	1.50	25	95	
6227	2.00	25	95	Ctd.
40,616	2.50	36	96	Ctd.
6302	1.00	15	98	C
6424	2.00	24	100	

30,484	2.75	33	100	Mtd., Ctd.
30,483	2.00	33	100	Ctd.
40,614	2.50	36	100	Ctd.
6239	1.75	18	102	Ctd.
30,498	1.25	25	103	C, Ctd.

6357	2.00	34	103	‡
6259	1.50	26	104	
6303	1.25	17	105	A
30,488	2.50	22	105	Ctd.
6181	2.00	26	105	Ctd.

30,569	3.00	30	109	Ctd.
6162	2.00	25	122	A
6333	2.50	25	122	A, Ctd.
6334	1.75	25	122	
6233	2.25	25	122	Ctd.

6409	1.25	16	124	Ctd.
6410	2.00	16	124	Mtd., Ctd.
6411	1.50	21	126	A
30,482	2.25	26	126	A, Ctd.
40,615	2.50	40	126	Ctd.

40,899	4.00	40	126	Mtd., Ctd.
6176	2.00	38	130	
6285	2.50	38	130	Mtd.
6212	2.50	31	132	Ctd.
5175	1.50	32	132	

5182	2.00	32	132	Ctd.
6412	2.50	32	132	Mtd.
6413	1.75	38	132	A
6324	2.00	43	133	A
6364	2.00	27	134	

6256	1.25	29	136	C
6258	2.25	33	143	Ctd.
40,735	3.00	57	145	
40,618	3.25	42	147	Ctd.

‡ Airtspaced

OPTICS - ACHROMATS (Contd.)

No.	Price	Diam. Mm.	F.L. Mm.	Notes
6244	\$2.50	48	147	Mtd.
41,011	3.00	45	148	A, Ctd.
40,617	2.50	39	149	Ctd.
6327	1.50	46	163	C
6171	1.75	32	171	
6232	2.25	32	171	Ctd.
6316	2.75	32	171	Mtd., Ctd.
40,895	4.00	38	172	Ctd.
41,049	3.50	45	172	Ctd.
6423	3.50	52	172	
6253	2.00	32	176	
6353	3.50	35	176	Mtd., Ctd.
40,611	3.50	39	176	Ctd.
40,429	1.50	35	178	Mtd.
6231	3.00	51	180	
6208	3.50	51	180	Mtd.
6216	1.75	23	184	Ctd.
5221	3.00	51	184	

No.	Price	Diam. Mm.	F.L. Mm.	Notes
6415	\$2.25	32x34	190	
6313	2.25	45	191	
6183	2.75	45	191	Ctd.
40,970	3.25	45	191	Mtd., Ctd.
5117	3.00	52	193	
5216	3.50	52	193	Ctd.
40,685	3.50	33	215	Mtd.
40,672	4.00	39	215	Ctd.
6366	5.00	38	258	+
6329	1.00	25	279	C
40,864	4.00	29	283	A, Mtd.
40,894	3.50	29	305	A, Ctd.
6420	5.00	56	305	Ctd.
40,717	9.00	53	335	Ctd.
30,534	4.50	36	336	A
40,624	2.00	33	360	C, Ctd.
60,428	12.50	48	360	Mtd.
40,802	11.00	61	365	Ctd.

No.	Price	Diam. Mm.	F.L. Mm.	Notes
40,981	\$8.50	46	508	Ctd.
30,201	3.50	32	788	Ctd.
30,202	5.00	42	1041	Ctd.†
30,190	32.00	76	1143	Ctd.†
30,187	9.50	51	1270	Ctd.†
50,107	69.00	102	1524	Ctd.†
70,163	125.00	127	1803	Ctd.†
70,383	195.00	153	2286	Ctd.†

†Airsaced

NEGATIVE ACHROMATS

60,122	\$23.50	26	—44	Mtd.
30,448	3.00	18	—47	
40,574	3.00	29	—77	
40,573	3.00	23	—83	
30,255	4.00	42	—139	Ctd.

Millimeter-inch conversion table.
see page 97.

OPTICAL GLASS WORKING—F. Twyman, F.R.S.

This is a hard-cover, abridged version of Mr. Twyman's very important earlier book "Prism and Lens Making" which is now out of print. Includes the important recent developments in optical workshop practice. Chapters on prisms and lenses, quantity production, spectacle and microscope lenses, non-spherical surfaces, testing, the Hilger interferometers, surface treatments, large glasses and mirrors. 275 pages (6" x 8½").

No. 9376 \$9.50 Postpaid

LIGHT Alexander Efron, EE, Ph.D.

Covers introduction to light, reflection, refraction, wave nature of light, the visible and invisible spectrum, optical instruments and illumination. Paper bound, 127 pages. (5½" x 7½").

No. 9282 \$2.25 Postpaid

PRINCIPLES OF OPTICS

Hardy and Perrin

MIT professors collaborated on this book. Chapters on History of Optics; Lens Aberrations; Manufacture of Optics; Ophthalmic Instruments; Spectroscopic Apparatus, 632 pages. (6½" x 9¼").

No. 9202 \$12.50 Ppd.



GIGANTIC OPTICAL BARGAIN \$10.00 VALUE ... Only \$3.50 Ppd.

Here is a variety of our most popular items all in one package that saves you money and time. It makes a nice gift item for any young person, or for Dad too if he likes unusual things. You get all of the following items:

(1) Prism. Use it to see the spectrum, for experimenting, etc. (2) Fun With Optics. 32-page information and instruction book on optics. (3) Beginner's Lens Kit. Instruction booklet and valuable assortment of 10 lenses to make many small optical items. (4) Star and Satellite Path Finder with instructions. (5) Diffraction Grating. A piece of this in a 35mm mount that will amaze you and your friends. (6) Rectangular Magnifier. Size 2½" x

1¾". With 1.8 power (7) Polarizing Filters. two of these are included for experimenting or for use on your microscope, to make a polariscope, etc. (8) Five double-convex Lenses, 14mm x 48mm. Combine two to make a useful, high-power magnifier.

All of the above items.

No. 50,204 \$3.50 Postpaid



EDMUND'S FAMOUS LENS KITS

FOR HOBBYISTS, EXPERIMENTERS, CLASSROOM DEMONSTRATIONS

The quality lenses in these fascinating kits are worth many times the price you pay. Because they are slightly chipped at the edges we can offer them at these low prices. They are of good optical quality and are ideal for the classroom, scout projects, hobbies and experiments.

Any one of the kits is excellent for teaching and studying the principles of optics. With this in mind you will also enjoy reading Edmund's "Fun With Optics" (see page 76). It contains more instructions about the use and application of optics.



10 LENS KIT

FOR HOBBYISTS

Includes 10 useful glass lenses. You can easily make a 4.4X Galilean Telescope, 12.4X Astro Telescope, 3X Double Lens Magnifier, 5X and 14X Pocket Magnifiers, 40X Microscope, 35mm. Slide Viewer and other useful instruments. Sixteen-page, illustrated instruction booklet. Order Kit No. 2, \$1.50 Postpaid.

40 LENS KIT

FOR EXPERIMENTERS

This larger and more versatile kit includes 45 glass lenses, all marked with individual specifications. Its greater variety allows more advanced experimentation. Make all of the instruments listed in Kit No. 2 plus many more of your own choice. Sixteen-page, illustrated instruction booklet. Order Kit No. 5, \$7.00 Postpaid.

80 LENS KIT

FOR EDUCATION

An extra large assortment totaling 80 glass lenses. Each is individually packaged and identified by type (convex, concave, meniscus, etc.) focal length, and diameter. We recommend this set for the classroom, optical laboratory and advanced amateur. Includes 32-page project book "Fun With Optics" described on page 76. Order Kit No. 10, \$12.50 Postpaid.

SIMPLE LENSES

Here's the largest collection of simple lenses under one roof! They have been gathered from many different sources; some war surplus, some commercial. All are sold as "seconds" because of slight chips, scratches, or similar small imperfections. In most cases, however, the imperfections will not interfere with the use of the lens.

We cannot fill special requests for perfect lenses, or for coated ones. **Occasionally, when the exact lens you order is out of stock, we will substitute another lens that most nearly fits your requirements unless your order states "no substitutes."**

When ordering, please remember to include: (1) The type of lens you want, such as "plano-convex," "double-convex," etc. (2) The diameter, focal length and price of the lens. (3) When ordering a negative lens, be sure to prefix the focal length with a minus sign.

Our minimum order is **\$2.00**, but items besides these lenses may be included in your order to make up the minimum amount.

See page 97 for mm. to inch conversion tables.

Better Grade Simple Lenses

Over the years we have received requests from our customers for BETTER GRADE simple lenses. We have selected the very best from each lot. These are listed below the ordinary simple lenses of each type. Please be sure to specify BETTER GRADE when ordering!

PLANO-CONVEX LENSES

Plano-convex lenses have one flat face and one curved face. They are thicker in the middle than at the edges. Useful as eyepiece lenses, magnifiers and as objectives on inexpensive microscopes.



No.	Diam. Mm.	F. L. Price Mm. Ppd.	No.	Diam. Mm.	F. L. Price Mm. Ppd.
94,670	6	7 \$0.90	94,034	12.5	38 \$0.40
94,001	8	11 .90	94,031	15.5	38 .50
94,003	5	13 .45	94,035	19.5	38 .50
94,004	5	14 .40	94,036	39	38 .50
94,005	9	15 .75	94,037	13	39 .40
94,006	6	16 .50	94,038	5.5	40 .30
94,007	10	17 .80	94,039	10	40 .30
94,008	11	18 .95	94,040	16	40 .45
94,009	10	19 .55	94,041	22	40 .55
94,013	8	20 .40	94,042	23	41 .50
94,011	8.5	20 .50	94,043	19	42 .45
94,010	11	20 .60	94,044	27	42 .65
94,014	10	22 .45	94,045	6	45 .30
94,017	5x5	23 .35	94,046	6x6	45 .30
94,016	6.5	23 .40	94,049	17.5	49 .40
94,018	9	23 .50	94,050	20	50 .45
94,015	12.5	23 .85	94,052	35	52 .65
94,020	9.5	25 .40	94,053	48	52 .60
94,021	13.5	25 .50	94,054	7x7	53 .30
94,022	13	26 .60	94,055	8	55 .30
94,023	13.5	27 .40	94,056	10	55 .30
94,024	12	28 .40	94,057	33	57 .60
94,025	4	30 .40	94,058	6	58 .50
94,026	9	30 .35	94,060	4	60 .40
94,027	7	31 .35	94,061	35	61 .30
94,028	6	35 .30	94,063	26	64 .35
94,029	12.5	35 .50	94,064	19	67 .30
94,030	17	37 .40	94,065	5	68 .30
94,032	8	38 .30	94,066	11	69 .30
94,033	10.5	38 .40	94,067	6	70 .35

PLANO-CONVEX (Continued)

No.	Diam. Mm.	F. L. Price Mm. Ppd.	No.	Diam. Mm.	F. L. Price Mm. Ppd.
94,684	63	72 \$1.00	94,105	27	172 \$0.35
94,068	7	73 .30	94,106	31	172 .35
94,069	43	76 .60	94,108	5	186 .30
94,071	60	79 1.00	94,111	31	188 .35
94,072	8	81 .30	94,113	4	195 .30
94,073	21	81 .30	94,114	19.5	201 .30
94,074	51	83 .90	94,115	28	201 .30
94,075	4.5	85 .30	94,116	8	203 .30
94,076	28	87 .50	94,117	94	229 1.25
94,077	7	92 .30	94,118	8	230 .30
94,078	43	92 .60	94,119	15.5	238 .45
94,079	54	92 1.50	94,120	33	254 .40
94,080	43	93 .60	94,121	110	260 1.75
94,081	18	94 .40	94,122	9	265 .30
94,082	16†	95 .45	94,123	38	279 .75
94,083	25	95 .50	94,124	50	282 .75
94,085	14	97 .35	94,125	48	286 .65
94,087	29	99 .35	94,126	51	293 1.00
94,088	25	100 .35	94,127	89	305 3.75
94,089	24	105 .35	94,683	88	318 4.00
94,090	12	109 .30	94,129	28	393 .40
94,091	5.5	114 .30	94,130	33	393 .40
94,092	28	114 .30	94,131	44	401 .50
94,093	8	116 .30	94,132	33	453 .45
94,094	25	123 .40	94,133	89	483 3.50
94,095	7.5	125 .50	94,134	25	508 .60
94,096	24	127 .35	94,135	86	571 2.00
94,097	19	147 .35	94,677	88	635 3.00
94,098	9.5	150 .30	94,136	21	868 .45
94,099	12	150 .30	94,137	19	1016 .60
94,101	5	152 .30	94,138	25	1019 .80
94,100	16	152 .30	94,139	29	1031 .50
94,102	31	152 .35	94,140	30	1031 .50
94,103	24	159 .35	94,141	27	1269 .60
94,104	28	167 .35	94,142	11.5	1270 .30

BETTER GRADE PLANO-CONVEX

No.	Diam. Mm.	F. L. Price Mm. Ppd.	No.	Diam. Mm.	F. L. Price Mm. Ppd.
94,147	10.5	38 \$0.40	94,166	5	85 \$0.30
94,148	12.5	38 .55	94,168	5.5	92 .35
94,685	16*	40 .90	94,169	8	94 .35
94,149	23*	41 .75	94,170	5.5	111 .30
94,150	9	42 .35	94,171	6	134 .30
94,152	17	49 .50	94,172	20.5	136 .45
94,153	15.5	50 .90	94,173	16	152 .40
94,154	16	51 .75	94,174	7	154 .35
94,155	28	51 .75	94,175	27	172 .60
94,156	7x7	53 .40	94,176	6	201 .35
94,157	26	54 .80	94,679	76	224 2.50
94,161	7.5	60 .30	94,667	40	285 1.00
94,163	24	75 .50	94,178	31	393 .60
94,164	16.5	79 .70			

Coated *

† Mounted

DEMONSTRATION LENS SET . . . NDEA APPROVED



For classroom or individual work. Plano-convex, convex-concave, double convex, concave-convex and plano-convex. All 50mm diam. 8" F.L.

No. 40,414
\$5.00 Ppd.

See our listings of Fiber Optics on pages 12, 87, 94, and Fresnel Lenses on page 93.

OPTICS - SIMPLE LENSES

DOUBLE-CONVEX LENSES

Double-Convex lenses have two curved faces, and are thicker at the center than at the edges. Some are symmetrical (with both faces curved equally), while others have steeper curves on one side than on the other.



No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,672	5.5	5 \$0.75	94,251	23	41 \$0.40
94,180	5	7 .75	94,252	27	41 .50
94,181	6	7.5 .95	94,253	36	41 .70
94,183	4	8 .70	94,254	27	42 .40
94,182	6	8 .80	94,255	25	43 .65
94,184	5.5	9 .50	94,256	29	43 .40
94,185	9	9.5 .85	94,257	35	43 .65
94,187	8.5	12 .75	94,258	37	43 .50
94,186	12	12 .75	94,259	15	45 .30
94,192	5	13 .60	94,260	17	45 .30
94,194	10	13 .45	94,261	18.5	45 .40
94,188	10	13 .95	94,262	25	45 .35
94,195	11	13 .50	94,263	32	45 .60
94,189	17	13 .90	94,264	36*	45 .90
94,191	12.5	13 .75	94,265	16	46 .30
94,197	7.5	15 .50	94,266	27	46 .50
94,196	14	15 .65	94,267	19*	47 .35
94,652	15	15 .85	94,268	20.5	47 .35
94,198	17.5	16 .75	94,270	14	48 .30
94,199	17	17 .90	94,269	31	48 .65
94,203	5	18 .45	94,271	9.5	50 .35
94,201	7.5	18 .35	94,272	14	50 .30
94,204	8	18 .60	94,274	25	50 .90
94,202	10	18 .40	94,277	16	51 .30
94,205	13	18 .75	94,278	8	52 .60
94,200	16	18 .70	94,279	21	52 .30
94,206	17.5	18 .70	94,280	28	52 .45
94,208	11	19 .75	94,281	19	53 .30
94,209	15	19 .65	94,282	37	53 .80
94,207	16	19 .65	94,283	32	54 .50
94,212	15	20 .55	94,284	33	55 .60
94,213	17	20 .60	94,285	24	57 .90
94,214	18	20 .60	94,673	13	58 .70
94,211	21	20 .75	94,286	24	58 .70
94,210	25	20 .80	94,287	32	58 .30
94,215	12	21 .45	94,288	58	58 1.00
94,216	20	21 .60	94,289	32	59 .30
94,217	23.5	22 .90	94,290	35	59 .30
94,218	5.5	23 .30	94,291	9x9	59 .30
94,219	12*	23 .80	94,292	18	68 .30
94,220	16	23 .65	94,293	60	62 1.00
94,222	17	24 .50	94,294	20.5	63 .40
94,223	13	26 .40	94,295	31	63 .40
94,224	16	26 .60	94,296	24	64 .35
94,225	29	26 .75	94,297	34	64 .40
94,226	32	26 .75	94,298	40	64 .45
94,227	15	29 .45	94,299	6	65 .30
94,228	26	30 .60	94,300	27	65 .45
94,229	32	30 .75	94,301	33	65 .35
94,230	35	31 .80	94,302	37	66 .50
94,231	40	31 .75	94,303	13	67 .30
94,232	13	33 .30	94,304	31	69 .50
94,233	40	33 .75	94,305	76	71 1.75
94,234	16	34 .45	94,306	60	72 .90
94,235	34	34 .80	94,307	27	74 .45
94,236	14.5*	35 .55	94,308	21.5	75 .40
94,237	36	35 .80	94,309	24	76 .30
94,238	25	36 .60	94,310	32	77 .40
94,239	15	37 .45	94,311	32	77 .35
94,240	19	37 .45	94,671	7	80 .75
94,241	21	37 .35	94,312	51	83 .40
94,243	13	38 .30	94,313	60	83 1.00
94,244	19.5	38 .40	99,058	9x9	83 .50
94,245	22	38 .45	94,314	45	85 .35
94,242	33	38 .55	94,315	52	87 .35
94,246	9.5	39 .30	94,316	24	89 .30
94,247	17.5	39 .35	94,318	56	89 .60
94,248	20	39 .40	94,319	74	91 1.50
94,249	24	40 .60	94,320	38	100 .40
94,250	21.5	41 .40	94,321	24	102 .40

No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,650	41	100 \$1.10
94,654	72	129 4.50
94,325	52	174 .40

No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,326	77	182 \$0.90
94,680	95	191 2.00
94,329	89	250 2.00

* Coated

BETTER GRADE DOUBLE-CONVEX

* Coated
† Mounted

No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,333	4.5	6 \$0.90	94,360	25	42 \$0.75
94,335	7.5	15 .75	94,361	21	43 .45
94,336	17*	17 1.00	94,362	17.5	44 .45
94,337	17.5	17 .90	94,363	46*	44 1.20
94,338	8	18 .90	94,364	48	44 .90
94,339	17.5	18 .90	94,365	27	46 1.00
94,342	18	20 .85	94,366	5	47 .30
94,340	25	20 1.00	94,367	21	50 .55
94,343	25*	21 1.25	94,368	12*	55 .90
94,344	20	25 .75	94,369	33*†	55 1.00
94,345	11.5	29 .60	94,370	33*	55 .70
94,346	28	30 .60	94,372	23	59 .50
94,348	33	30 .60	94,373	38	61 .90
94,349	20.5	33 .65	94,374	36	64 .65
94,350	38	33 1.10	94,375	33	65 .60
94,352	14.5†	35 .75	94,376	26	68 .45
94,351	18	35 .50	94,377	35	72 .70
94,353	26*	35 .75	94,380	32*	82 .70
94,354	12	38 .35	94,381	54	88 .70
94,355	13.5	38 .35	94,383	47	95 .80
94,356	14	38 .35	94,385	52	106 .60
94,357	18*	38 .65	94,388	29*	114 .80
94,358	9.5	39 .40	98,007	95*	147 9.00
94,359	16	39 .50	94,653	129	235 9.00

PLANO-CONCAVE LENSES

Plano-concave lenses are flat on one side and curved inwardly on the other, thinner at the center than at the edges. These are all reducing lenses and have a negative focal length.



No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,674	5.5	-5 \$0.50	94,408	33	-62 \$0.50
94,389	5	-20 .30	94,410	13	-68 .30
94,390	7.5	-20 .30	94,411	15.5	-74 .30
94,391	13.5	-22 .40	94,412	19	-75 .35
94,392	14	-25 .40	94,413	32	-75 .50
94,393	12.5	-26 .40	94,414	53	-80 .60
94,394	5x7	-26 .30	94,415	36	-81 .60
94,395	16	-30 .35	94,416	22	-85 .35
94,396	18	-30 .35	94,417	10	-86 .30
94,397	25	-33 .50	94,418	13	-89 .30
94,398	13	-35 .35	94,419	22	-99 .45
94,399	14	-36 .30	94,420	16.5	-100 .30
94,400	18	-36 .40	94,421	17	-127 .30
94,401	7.5	-40 .30	94,422	23	-134 .40
94,402	13.5	-46 .30	94,423	18	-136 .30
94,403	16	-47 .30	94,678	63	-136 3.00
94,404	7	-50 .30	94,424	22	-141 .40
94,406	16	-61 .35	94,425	12	-148 .30
94,407	30	-61 .35	94,426	24	-296 .60

BETTER GRADE PLANO-CONCAVE

No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,427	5x7	-26 \$0.40	94,434	33	-48 \$0.70
94,428	16.5	-33 .60	94,436	13	-61 .35
94,429	18	-33 .65	94,435	16	-61 .45
94,430	15.5	-39 .60	94,437	29	-73 .75
94,431	10	-41 .35	94,438	15.5	-74 .40
94,432	13.5	-46 .40	94,439	16.5	-100 .60
94,433	16	-47 .50			

Satisfaction guaranteed or your money back.

DOUBLE-CONCAVE LENSES



Double-concave lenses are curved inwardly on both sides and thinner at the center than at the edges. These are also reducing lenses and have a negative focal length.

No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,440	5	-4 \$0.45	94,464	34	-40 \$0.60
94,475	6	-8 .45	94,465	42	-41 .75
94,441	9	-8.5 .40	94,466	20	-43 .50
94,442	10	-13 .35	94,467	23	-43 .50
94,443	12	-13 .40	94,468	27	-44 .60
94,444	10*	-14 .40	94,469	50	-44 .80
94,445	13	-17 .35	94,470	17	-47 .40
94,446	11	-18 .30	94,471	15	-48 .40
94,447	12	-20 .30	94,472	25	-48 .40
94,448	18	-21 .40	94,473	11	-50 .30
94,449	20	-23 .45	94,474	12.5	-50 .30
94,450	15	-24 .50	94,476	19	-50 .30
94,451	25	-25 .70	94,478	17.5	-52 .40
94,452	17	-27 .40	94,479	17	-55 .30
94,453	23	-27 .50	94,480	19	-56 .30
94,454	15.5	-28 .40	94,481	17	-58 .30
94,455	17	-29 .45	94,482	17	-62 .30
94,456	20	-29 .45	94,483	12	-68 .30
94,457	19	-30 .40	94,484	17	-68 .30
94,458	21	-30 .40	94,485	19	-70 .30
94,459	11.5	-31 .40	94,486	17	-71 .30
94,460	26	-32 .50	94,487	19	-79 .45
94,461	19	-35 .35	94,488	17.5	-106 .40
94,462	22	-37 .50	94,489	33	-117 .60
94,463	33	-38 1.00	94,492	38	-153 .65

* Coated

BETTER GRADE DOUBLE-CONCAVE

No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,476	10*	-28 \$0.60	94,502	11	-50 \$0.35
94,493	19.5*	-29 .75	94,503	17.5	-52 .50
94,494	29	-30 .75	94,504	25*	-54 .60
94,495	30	-38 .90	94,505	27	-54 .50
94,496	33	-38 1.25	94,506	16.5	-60 .45
94,497	17	-34 .65	94,507	19*	-79 .75
94,498	22*	-37 .90	94,681	98	-119 2.50
94,499	30*	-38 1.00	98,006	95*	-201 7.50
94,500	10.5	-45 .40			
94,501	25*	-48 .65			

* Coated

MENISCUS (Convex-Concave)



Meniscus lenses are curved on both faces. Unlike double-concave lenses the curves are more or less parallel to each other. Positive meniscus is thicker in center than at edges, negative meniscus is thicker at the edges.

POSITIVE MENISCUS

No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,510	12	34 \$0.35	94,520	14	84 \$0.30
94,511	10	45 .30	94,521	18	85 .30
94,512	6.5	47 .30	94,523	21	92 .30
94,513	10	51 .30	94,524	18	95 .30
94,514	15	52 .30	94,525	21.5	98 .30
94,515	12	58 .30	94,644	30	100 1.00
94,516	10	69 .30	94,526	15	101 .30
94,517	14	69 .30	94,527	23	103 .35
94,518	18	80 .30	94,528	35	105 .60
94,519	14	81 .30	94,529	41	106 .60

POSITIVE MENISCUS (Continued)

No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,530	12.5	109 \$0.30	94,543	18	212 \$0.30
94,531	35	109 .45	94,544	20	238 .35
94,532	34	110 .45	94,642	30	250 1.00
94,533	18	112 .30	94,648	41	250 1.10
94,534	27	120 .40	94,682	21†	254 1.00
94,535	33	120 .45	94,545	47	263 .90
94,536	26	123 .40	94,546	21	293 .35
94,537	16	124 .30	94,641	30	333 1.00
94,538	59	132 .65	94,647	41	333 1.10
94,539	18	136 .30	94,548	38	403 .50
94,540	99	150 2.50	94,640	30	500 1.00
94,541	20	166 .35	94,646	41	500 1.10
94,643	30	166 1.10	94,661	88	567 2.50
94,649	41	166 1.10	94,639	30	1000 1.00
94,542	21	206 .30	94,645	41	1000 1.10

* Coated

† Mounted

BETTER GRADE POSITIVE MENISCUS

No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,551	6	48 \$0.35	94,561	25*	136 \$0.50
94,552	15	52 .45	94,562	10	152 .50
94,553	14*	62 .50	94,665	51	166 1.00
94,554	33*	78 .90	94,664	51	222 1.00
94,555	27*	85 .60	94,668	55	285 1.00
94,556	19*	87 .50	94,662	51	308 .90
94,557	18	91 .40	98,003	146*	381 9.50
94,558	42*	96 .90	94,663	51	400 .75
94,559	16	111 .35	98,004	157*	952 9.75
94,560	62	132 2.00			

NEGATIVE MENISCUS

† These are reducing lenses and have a negative F.L.

No.	Diam. Mm.	F.L. Price Mm.† Ppd.	No.	Diam. Mm.	F.L. Price Mm.† Ppd.
94,563	5	-8 \$0.65	94,584	34	-93 \$0.60
94,564	9	-15 .45	94,585	42	-93 .50
94,565	9	-17 .50	94,586	40	-95 .50
94,566	12	-27 .35	94,587	33	-106 .35
94,568	11	-33 .35	94,588	42	-112 .40
94,567	16	-33 .40	94,589	31	-116 .40
94,569	18.5	-37 .40	94,590	25	-118 .35
94,570	23.5	-39 .50	94,591	37	-125 .35
94,571	18	-44 .40	94,592	34	-127 .35
94,572	13	-48 .35	94,593	25	-128 .35
94,573	29	-55 .50	94,594	35	-132 .40
94,574	40	-61 .45	94,595	56	-132 .50
94,575	27	-63 .35	94,596	28	-136 .45
94,576	21	-66 .35	94,597	52	-169 .50
94,577	12	-72 .30	94,598	55	-169 .50
94,578	27	-72 .45	94,599	38	-186 .50
94,580	35	-73 .50	94,600	18	-191 .50
94,579	28	-75 .70	94,601	51	-264 .65
94,581	17.5	-80 .45	94,602	50	-800 .75
94,582	30	-88 .50	94,603	34	-1399 .30
94,583	18	-89 .50			

BETTER GRADE NEGATIVE MENISCUS

No.	Diam. Mm.	F.L. Price Mm. Ppd.	No.	Diam. Mm.	F.L. Price Mm. Ppd.
94,605	12.5	-20 \$0.65	94,619	14	-127 \$0.50
94,606	13*	-23 .70	94,620	36	-157 .60
94,607	13*	-31 .60	94,621	57	-180 .90
94,608	15	-39 .75	94,622	57	-214 .80
94,609	15.5	-41 .50	94,624	52	-238 1.50
94,610	17.5	-43 .45	94,623	43	-246 .90
94,611	32	-63 .70	94,625	89	-262 2.50
94,612	14.5	-72 .35	98,000	131†	-363 9.00
94,613	24	-74 .70	94,626	63	-475 1.00
94,614	41	-75 .70	94,627	56	-635 .90
94,615	40	-84 .60	98,002	140*†	-635 9.25
94,616	49	-93 .75	94,628	56	-722 1.00
94,617	32*	-103 .60	94,629	56	-913 .90
94,618	49	-112 .80			

* Coated

† Beveled

OPTICS - SIMPLE LENSES

RECTANGULAR SIMPLE LENSES

Can be used just as you'd use a round lens. Excellent for reading glasses or similar applications, because mounting is simple and quickly done.

No.	Size Mm.	F. L. Mm.	Price Ppd.
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Plano-Convex

99,001	13x13	31	\$0.30
99,003	7.5x7.5	36	.30
99,004	11x14	43	.30
99,005	11x12	51	.30
99,006	10x10	55	.30
99,007	10x10	69	.30
99,008	13.5x18	70	.30
99,009	12x16	73	.30
99,010	14.5x19	78	.30
99,011	49x71	135	.80
99,012	44x64	136	.60
99,013	49x71	186	.75
99,014	63x63	234	1.10

Better Grade Plano-Convex

99,015	13.5x18	70	\$0.40
99,015	44x64	136	.90

Double Convex

99,017	7.5x7.5	18	\$0.30
99,018	15x15	23	.50

No.	Size Mm.	F. L. Mm.	Price Ppd.
99,019	10x10	39	\$0.30
99,020	12.5x16	50	.75
99,021	51x51	64	.50
99,022	51x51	126	.75

Plano-Concave

99,024	9x16	-15	\$0.35
99,025	14x14	-24	.40
99,026	8x12	-31	.30
99,027	13x18	-33	.40
99,028	10x10	-35	.30
99,029	7.5x10.5	-37	.30
99,030	12.5x12.5	-37	.35
99,031	7x10	-43	.30
99,032	11.5x11.5	-43	.30
99,033	9x11.5	-45	.30
99,034	8x10	-51	.30
99,035	11x14	-51	.30
99,036	19x28	-55	.60
99,037	22x22	-55	.50
99,038	8x11	-58	.30
99,039	16x16	-73	.30
99,040	10x14	-74	.30
99,041	11.5x17	-89	.30
99,042	22x14	-100	.30

No.	Size Mm.	F. L. Mm.	Price Ppd.
99,043	17x22	-136	\$0.30
99,044	127x153	-381	3.00
99,045	32x85	-1088	1.00

Better Grade Plano-Concave

99,046	14x19	-47	\$0.40
99,047	10x14	-74	.40

Double-Concave

99,048	9x13	-25	\$0.30
99,049	9.5x12.5	-30	.30
99,050	10x10	-31	.35
99,051	11x15	-39	.30
99,052	10x10	-42	.30
99,053	11x14	-51	.30
99,054	12x12	-52	.30
99,055	11x15	-64	.30
99,056	12x17	-89	.30

Negative Meniscus

99,057	12x16	-85	\$0.30
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MAKE YOUR OWN MAGNIFIER

Use these lenses as they are or add mounts for the sake of convenience.

These are unmounted commercial magnifiers that are seconds because of slight chips, scratches, etc. In most cases, the defect will not interfere with the performance of the finished magnifier. All are double-convex type. Mount two similar ones for double the magnification listed.

No.	Diam. in Mm.	F. L. in Mm.	Mag.	Price Ppd.
12,071	25	62	4x	\$0.30
12,072	26	32	9x	.30
12,073	26	44	8x	.30
12,078	29	26	10x	.45
12,075	30	43	8x	.45
12,053	31	77	4x	.30
12,092	46	95	2x	.35
12,077	54	70	4x	.50
12,078	59	67	4x	.50
12,091	60	59	4x	.50
12,054	60	64	4x	.50
12,011	64	100	2.5x	.50
12,080	64	127	2x	.50
12,081	64	143	1.8x	.50
12,082	64	165	1.5x	.50
12,010	64	154	1.6x	.50
12,013	76	182	1.4x	.50
12,035	76	200	1.2x	.50
12,015	89x50	200	1.2x	.50
12,016	102	250	1.0x	1.25

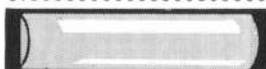
Rectangular Magnifier Lenses

12,028	26x60	203	1 1/4x	\$0.30
12,031	32x60	178	1.3x	.40
12,021	32x76	203	1 1/4x	.50
12,061	35x57	106	2.4x	.50
12,067	38x50	64	4x	.50
12,056	38x50	83	3x	.50
12,033	38x76	182	1.3x	.50
12,062	45x64	133	1.8x	.50
12,063	43x76	138	1.8x	.50
12,051	51x51	64	4x	.50

Rectangular Magnifier Lenses (Contd.)

12,029	51x51	127	2x	\$0.50
12,060	64x64	91	3-1/3	.60
12,057	64x64	235	1.0x	.60
12,019	51x102	203	1 1/4x	.65

Order our 11-page, illustrated booklet "Home-made Magnifiers." No. 9002 Only 20¢ Ppd.



CYLINDER LENSES

These magnify in only one dimension. They are ground and polished optical glass.

No.	Size in Mm.	F. L. in Mm.	Price Ppd.
12,041	3x4	3	\$0.30
12,042	3x9	3	.50
12,043	3.5x5	3.3	.40
12,044	4x5.5	5.6	.35
12,045	5x8.5	8.5	.40
12,046	5.5x7.5	5.9	.45
12,050	3x9	1.4	.40

Large-size cylinder lenses. These are plate glass and are slight seconds only because of small edge chips.

No.	Size in Mm.	F. L. in Mm.	Price Ppd.
40,212	24x169	44	\$1.90
30,240	54x200	100	2.25
50,157	54x404	100	3.00

FRESNEL LENSES

A Fresnel lens is a flat, thin piece of glass or plastic on which has been molded a series of small, concentric stepped zones. They extend from center to outer margin. Each groove is a minute refracting facet capable of bending light. Its transmittance (ability to pass light) is greatly increased over that of a conventional lens of the same focal length. Thus a large diameter, lightweight and inexpensive lens with a short focal length is possible. See listings on pages 93 and 104.

TYPES OF CONDENSERS



Condensing lenses are used to concentrate light into a projected beam. Condensers are used in projectors, enlargers, spotlights and photo-cell systems, to name a few of the many instruments utilizing them. Generally, condensing lenses are used in pairs, mounted so that their convex surfaces are nearly in contact. When used in pairs as above, the equivalent focal length of the combination is equal to one half the focal length of one of the lenses alone.

Condenser-type enlargers produce snapper prints than enlargers without condensers. Usually, a pair of plano-convex lenses are used for this purpose. Two unsymmetrical-convex or double-convex lenses are used in projectors. Sometimes, a single condenser is used. All slide projectors are made with condensing lenses.

To determine the size condensers you need, draw a circle around the maximum size slide, etc., you will be projecting. Because of mounting, and the fact that the slide

will be a short distance from the condensers, you should buy a lens that is larger in diameter than the circle. Suggestions:

Picture or (Slide Size)	Diameter in Inches	F. L. in Inches of Condenser to Use
8mm	3/4 to 1 3/4	1/2 to 3
16mm	1 to 1 3/4	1 to 3
35mm	2 to 3	3 to 4
1 1/4" x 1 5/8"	2 3/8 x 3 1/2	3 to 5
1 1/8" x 1 3/8"	2 1/2 x 3 1/2	3 1/2 to 5
1 3/8" x 2 1/2"	3 1/2 to 5	4 1/2 to 7
2 1/4" x 2 1/4"	4 to 5	5 to 7
2 1/4" x 3 1/4"	4 1/2 to 5	5 1/2 to 7
2 1/2" x 4 1/2"	6 to 7	9 to 10
4" x 5"	6 1/2 to 8	10 to 12

Most of the lenses listed are seconds because of small chips, scratches, bubbles, etc. However, these imperfections will not interfere with the quality of the image, since the defects are not projected to the same plane as the film. In spite of our low prices, we guarantee them.

Our list of simple lenses include additional lenses that could be used as small condensers.

Prices shown are for one lens. Remember, projectors and enlargers normally require two.

No.	Price, Ppd.	Diam. Inches	F. L. Inches	Comments
1182	\$0.35	3/4	1 3/4	PCX frosted on plano side for even diffusion.
30,541	.75	5 5/64	4 5/64	Unsym, DCX, Ctd.
30,525	.85	1 5/16	1 11/32	PCX
30,542	.50	5 5/64	4 5/64	Unsym, DCX, Ctd.
1150	.50	1 3/8	2	
1125	.50	1 3/8	2 1/8	
1118	.50	1 3/8	2 3/8	
30,499	.75	1 5/16	1 1/4	Unsym. Convex
1179	.60	1 7/16	2 3/4	
1152	1.00	1 1/2	3	
1183*	2.00	1 11/32	2 1/16	Men.
1086	.50	1 11/16	3	
1122	.75	1 7/8	3 1/4	
1185*	3.00	1 29/32	2 3/4	PCX
30,543	1.00	1 59/64	2 1/2	
1155	.60	1 15/16	5	
1134	.50	2 x 2 (sq.)	2 1/2	Double-Convex
4034	1.50	2	3	2 lenses unsym.
1115	.75	2	3 1/4	
1123	.75	2	3 1/2	Unsymmetrical
40,883*	1.90	2 1/4	2 3/4	PCX (See note.)
1158	1.00	2 1/8	2 3/4	Unsymmetrical
1159	1.00	2 1/8	3	

No.	Price, Ppd.	Diam. Inches	F. L. Inches	Comments
1160	1.00	2 1/8	3 1/4	
1140	\$0.50	2 1/4	4 1/4	Cut off 3 sides
1117	.75	2 5/16	3 1/4	
1146	1.25	2 3/8	2 1/2	Unsymmetrical
1162	1.25	2 3/8	3	Unsymmetrical
1077	1.00	2 3/8	3	
1163	1.25	2 7/16	2 1/2	
1164	1.50	2 7/16	3 1/2	
1142	1.00	2 1/2	2 3/4	
1085	1.00	2 1/2	3 1/2	
1169	1.50	2 5/8	3 1/2	
1190	2.00	3	4 1/2	PCX
40,340	2.00	3 37/64	3 15/64	(PCX) for Super
1144	6.00	4 7/16	6 1/2	Slides
1135	5.00	4 3/16	7 1/2	Pyrex
1145	9.00	5	7	
1189	5.00	6	14	PCX
1061	6.00	6 1/2	9	
70,302	11.00	6 1/2	9	Better Grade
70,303	20.00	8	10	Better Grade
70,304	25.00	8	12	Better Grade

*2043X GLASS. Made of special tempered heat absorbing glass that will withstand higher temperatures without breaking. The special manufacturing operation by which this glass is made results in a number of bubbles. These usually do no harm in terms of usability.

PLEASE NOTE: All are plano-convex unless otherwise noted. The condensers listed above are sold as slight "Seconds" because of slight chips or small imperfections which in no way limit their use.

ASPHERIC CONDENSERS

Aspheric condensers have a short focal length in relation to their diameter. Use these when a compact, intense light system is needed.

No.	Diam.	F. L.	Comments	Price, Ppd.
30,600	25mm	15mm	Unsymmetrical	\$1.00
40,227	44mm	34mm	Unsymmetrical	1.50
60,355	60mm	57mm	PCX	1.00
40,770	62mm	42mm	Unsym. Ctd.	1.50
60,358	57mm	73mm	PCX	1.50
60,359	67mm	46mm	PCX	1.50
60,356	70.5mm	62mm	PCX	1.00
40,339	72.5mm	46mm	Unsymmetrical	1.50
40,893	64mm	73mm	Unsymmetrical	1.50
60,357	74mm	73mm	PCX	1.50

HOW TO PROJECT AND CONDENSE LIGHT WITH LENSES . . . Only 75¢

This 15-page booklet is another important guide from the Edscorp Popular Optics Library. Deals with the practical uses and applications of condensing lenses in spotlights, projectors, beacons and many other devices. Also contains a complete description of various types of lamps, filaments, etc. **No. 9044 75¢ Ppd.**



PYREX CONDENSERS

No.	Diam.	F. L.	Comments	Price, Ppd.
30,505	34mm	36mm	PCX	\$1.50
30,506	35mm	33mm	PCX	1.25
40,228	35mm	57mm	PCX	.60
40,229	35mm	65mm	Unsym. DCX	.50
40,230	35mm	112mm	Meniscus	.50
1184	39mm	60mm	Meniscus	1.00
40,908	43mm	62mm	PCX	1.50
40,233	50mm	144mm	PCX	.75
40,234	60mm	80mm	Unsymmetrical	1.50

"ABC's of LASERS and MASERS" . . . Allan Lytel

The first easy-to-understand coverage of one of the most amazing developments of our time. Explains microwave and light frequency applications; describes use as a surgical knife, welding torch, gem cutter, etc. Chapters are: 1) Lasers and masers, 2) Quantum electronics, 3) Modulators and detectors, 4) Power supplies, 5) Communications, 6) Applications. Paperback, 95 pages (5 1/2" x 8 1/2") with 62 illustrations.

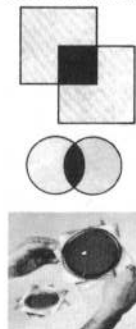
No. 9367 \$1.95 Ppd.

OPTICS - FILTERS

POLARIZING FILTERS

Polarization is a scientific means of reducing glare, observing strain, controlling light intensity, producing color effects and animated patterns. The polarizing filters listed below and at right have hundreds of applications. **IN PHOTOGRAPHY:** Use to darken backgrounds without affecting subjects, to eliminate glare on shining subjects, to shoot through windows. In color photography, use to darken skies or to change color values for "mood" shots. **ASTRONOMY:** Use a polarizing screen to eliminate planetary glare. **MICROSCOPY:** Mount on microscope to view specimens under different polarized lighting conditions. **INDUSTRIAL APPLICATIONS:** Polarizing materials aid in detecting flaws in metals, glass and other materials. Can be used for measuring the index of refraction or for building a polariscope for stress analysis of glass and clear plastics. Useful in gemology work, for deciphering charred records and in fiber or crystal identification. Large sizes make excellent anti-glare screens.

OPTICAL-QUALITY POLARIZING MATERIAL NOW AVAILABLE AT FRACTION OF NORMAL COST



Here's your opportunity to purchase optical-quality polarizing material at bargain prices. We bought a large supply and our prices pass this saving along to you. Available in large and small sheets and discs; each sandwiched between two sheets of clear butyrate plastic. Measures .030" thick. Rigid, easily cut with scissors to any convenient shape. Single-sheet transmission is approximately 30%; parallel double-sheet (one placed over the other) transmission approximately 22%. When sheets are crossed, transmission falls below 1%. Resistant to fading and delamination. Hundreds of uses in photography, education, industry and around the home. See page 2 for complete details and prices.

Variable Density Filters, In Metal Mounts . . . See Page 2

Polarizing Plastic Sheets. The filters listed here give wide angle polarization, have excellent permanence and resistance to sunlight and heat. Color is neutral black when filters are crossed. These are sheets of plastic, polarized Ethocel of .010" thickness. Light transmission average is 35%, crossed transmission is 2% maximum.

No. 70,418	One piece	5" x 5"	\$1.25 Ppd.
No. 70,419	One piece	10" x 10"	\$4.00 Ppd.
No. 70,420	One piece	20" x 20"	\$15.50 Ppd.

Glass-Mounted Polarizing Material. These fine filters were manufactured for the government but were rejected for minute defects. Quite suitable for most uses, they are priced at less than half of usual cost. Cemented between glass and extremely durable. Can be used in front of light sources for demonstration and teaching. Some pieces are tinted in blues, greens, browns, grays and combinations of these colors, but the tints do not affect light transmission. One alone transmits 32%; two parallel . . . 17%; two crossed . . . 1% max.

Polarizing Area	Stock No.	Price Ppd.	Polarizing Area	Stock No.	Price Ppd.
3 1/4" x 10"	60,468	\$ 8.00	2" x 2"	30,537	\$2.50
3 1/4" x 4 1/2"	40,749	4.50	2" x 10"	60,467	7.00
5" x 8"	60,469	12.00	1" x 1"	30,536	1.00

Sizes listed are the minimum clear areas of each filter. In some instances clear glass may extend beyond filter's edge. Cut the glass easily by scoring each side with a glass cutter and breaking. Then simply trim edges with tape.

POLARIZATION OF LIGHT . . .

A good grounding in the basic theories of light, retardation, refraction, birefringence and polarization. A full list of demonstrations and experiments is included. 52 pages. (4" x 6").

No. 9206 \$1.00 Postpaid

POLARIZING FILTERS

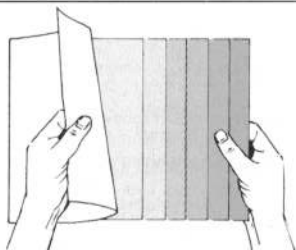
Stock No.	Diameter	Approx. Thick.	Approx. Trans. of White Light	Price Ppd.
30,529	16.5mm	3.5mm	20%	\$0.50
* 633	20mm	2mm	20%—2 in pkg.	.50
* 634	23mm	2mm	20%—2 in pkg.	.60
40,209	47mm	2mm	35%	2.00
40,863†	55mm	5mm	35%	2.00

* One of cover glass is neutral filter. † Slightly chipped

BARGAIN-PRICED WAR SURPLUS FILTERS

Stock No.	Diam. and Thick. (Mm)	Color	Approx. Transm.	Price, Ppd.
30,415	7 x 25 x 0.8	Dark Blue	5%	\$0.35
662	13 x 56 x 3	Black Mirror	None	.40
2717	16 x 1	Yellow	30%	.40
30,417	21.5 x 2.3	Light Yellow	60%	.40
694	22 x 2	Red	22%	.40
635	23 x 1.5	Light Neutral	45%	.40
2714	24 x 2	Neutral	less than 5%	.50
2715	24 x 2	Yellow	20%	.50
2716	24 x 2	Light Neutral	30%	.50
2710	26 x 2	Red	20%	.50
640	30 x 2	Red	18%	.50
639	30 x 2	Neutral	less than 5%	.50
638	30 x 2	Amber	45%	.50
2702	34 x 3	Green	8%	.50
30,419	35 x 3.2	Red	31%	.60
30,453	37 x 3	Yellow	78%	.75
30,452	37 x 3	Red	50%	.75
30,450	37 x 5.5	Yellow (Cem.)	80%	.75
30,449	37 x 5.5	Red (Cem.)	46%	.75
30,420	42 x 2.2	Red-Type 3	20%	1.00
699	44 x 2.5	Red	less than 5%	.75
30,421	44 x 3.8	Neutral	24%	.60
30,530	45 x 2	Red	35%	.75
641	50 x 5.4 x 3	Neutral	12%	.75
2711	51 x 2	Red	12%	1.00
2724	58 x 59.5 x 4	Neutral	10%	.50

Pkg. of 3. Mounted red, neutral and amber filters with flanges. Clear diam. 23mm; O.D. 38mm. **No. P-630 75¢ Ppd.**



COLOR FILTER SHEETS IN BOOKLET FORM

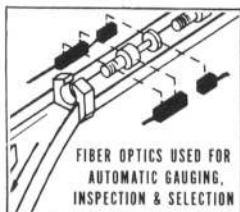
Color sheets of moisture proof, heat resistant cellulose acetate, 0.01" thick. Ideal for experimentation. The complete book of 44 sheets covers the entire color range. Book of 6 colors includes red, green, blue, yellow, magenta, and cyan (greenish-blue) . . . colors specially selected to give the most satisfactory results in the experimentation of color addition and subtraction.

Book of 6	{ Size 8" x 10"	No. 60,373	\$5.25 Ppd.
	{ Size 2" x 2"	No. 40,676	1.00 Ppd.
Book of 44	{ Size 8" x 10"	No. 70,638	15.00 Ppd.
. . . entire color range	{ Size, 5" x 8"	No. 60,403	8.00 Ppd.
	{ Size, 1" x 4"	No. 40,675	1.50 Ppd.

The 44 color filters, mentioned above, are now available in large 20" x 24" sheets. See details and prices on page 144.

Booklet of Spectral Absorption Curves for entire color range of filters listed above (covers sets of 6 filters also.)

No. 9081 50¢ Postpaid



Breakthrough! From Advanced Research Division of DuPont

PLASTIC FIBER OPTICS LIGHT GUIDES

Only 50c to 65c per foot!



People were predicting it. Now E. I. DuPont DeNemours & Co., world leader in plastics development and manufacture, has produced a plastic fiber optics light guide AT 1/5 TO 1/10 THE COST OF GLASS! And now Edmund Scientific Co. is offering them in any number of feet, 2 ft. or more.

Every home experimenter and hobbyist will want to utilize these revolutionary plastic light guides for exciting new projects impossible or extremely expensive until today. Why all the excitement? Well, these light guides transmit light from one point to another much as copper wire transmits electrical energy. By multiple reflection, light travels through the transparent core of each fiber in a zig-zag path from one end to the other.

With fiber optics light guides you can illuminate an almost unlimited number of remote, even inaccessible spots or areas with a single light source. **Applications for illumination include:** appliances; toys, games and novelties; signs; optical and electronic equipment; advertising displays; etc. Perfect for lights and signals on model train layouts. Used with photocells, they can count, select, detect, ignite or sort.

These new plastic light guides are more flexible than their glass counterparts. They can be bent around smaller corners and subjected to repeated flexing and vibration without damage—without any reduction in the amount of light being transmitted. Capable of transmitting from 310 to 1330 millimicrons and functioning fully in a temperature range from -40° to 175°F. The individual plastic fibers 10 mils. in diameter are non-coherently arranged in a black polyethylene jacket. Lose only 9% of light for each of the first 9 ft. Though ends are un-

finished, the following kit (No. 70,855) includes all materials for polishing and capping.

PLASTIC FIBER LIGHT GUIDES ONLY. Minimum order 2 ft.

Stock No.	Diam.	Number of Fibers	Minimum Radius of Bend	Light at End Sq. Inches	Price per foot Ppd.
2504	.087"	16	1/4"	.001	50c
2505	.110"	32	3/8"	.002	55c
2506	.119"	48	1/2"	.003	60c
2507	.130"	64	3/4"	.004	65c

Quantity prices for 200 ft. or more. See bulletin No. 73 COMPLETE EXPERIMENT KIT. Two 2-ft. long DuPont Plastic Light Guides—one with 16 and one with 64 fibers (the latter transmits 4 times as much light). With concentrating lens, portable penlight-type light source (less batteries) and rubber adapter for connecting guides. Also all materials needed to polish, color and cap the ends: epoxy cement (two 3/4-oz. tubes); 2 oz. of #600 alundum abrasive; 2 oz. of red jeweler's rouge; 50 ml. capping solution; and three 1/4-oz. packets of red, yellow and blue dye for color coding ends... simply add dye to capping solution. Complete instructions.

No. 70,855 \$10.00 Postpaid

Capping Solution only. 50 ml.

No. 40,949 \$2.00 Ppd.

Dye Set only. Three 1-oz. packets. **No. 40,948 \$4.00 Ppd.**

GLASS FIBER OPTICS GIVE MAXIMUM LIGHT TRANSMISSION!

Very thin, optically coated, glass fibers are bundled together in order to transmit light and images. Randomly arranged fibers transmit only light. Coherently arranged fibers transmit both images and light. In a glass fiber

of 50 microns diam., a light ray may be reflected 3,000-4,000 times per foot. Glass fiber optics light guides are less flexible but transmit more light than the plastic type. Both types have unlimited applications.



FLEXIBLE FIBER OPTICS LIGHT GUIDES

For use with illuminator listed at the right. These randomly arranged glass fibers are sheathed in plastic tubing with epoxypotted, ground and polished ends. Ends have plastic tips of 1 1/4" maximum length. Each has a numerical aperture of .55 and will take a cone of light 60°. About 70% of the light striking the end enters the fibers and about 10% of this light is lost for every foot of length. The Light Guides transmit wave lengths of 400 to 2,000 millimicrons. Unaffected by bending.

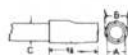
FIBER OPTICS ILLUMINATOR

Provides intense illumination for flexible light guides up to 3/8" in diameter. Output is continuously variable to maximum intensity. Contains 150-watt lamp (rated life at full voltage 10 hours), Tru-Flector, 60-cycle, 110-115 volts AC. Delivers following foot candles 2" from tip for each light guide listed: No. 40,640—550; No. 40,641—1800; No. 40,644—1500; No. 40,639—7500. Unit, mounted on aluminum chassis with steel coverplate has built in cooling fan. Enamel finish. 6" high x 5" wide x 8" long.

No. 70,709 \$81.00 Postpaid



SIZES IN TABLE

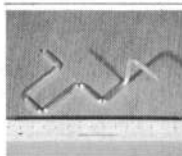


No.	Length	Diam.	*Min. Radius of Bend	A	B	Price
40,640	12"	1/16"	5/8"	5 1/2"	13 3/4"	\$13.00 Ppd.
40,641	12"	1/8"	3/4"	7 1/2"	16 1/2"	15.00 Ppd.
40,644	36"	1/8"	3/4"	7 1/2"	16 1/2"	21.00 Ppd.
40,639	12"	1/4"	1 1/2"	21 1/4"	18 3/2"	21.00 Ppd.

* (A) ± 1/64", (B) max. .065".

IMAGE CONDUIT

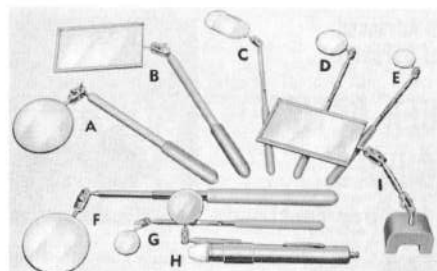
Thousands of fibers are fused together to form 1/8" rod which is capable of transmitting images from one end to the other. These have 71,000 fibers .0005" in diam. and provide a resolution of 80 lines per mm. Just heat in Bunsen to bend.



No. 40,642 Length 6" \$5.50 Postpaid
No. 40,643 Length 12" \$9.50 Postpaid

Also See Fiber Optics Idea Book and Light-Trees, Page 12; Experiment Kit, Page 94.

OPTICS - MIRRORS



BALL-JOINT GLASS INSPECTION MIRRORS GIVE ALL-ANGLE VIEWING—Low as \$1.50 Ppd.

- Double ball joints swivel mirror 360°. Tempered spring steel joints move freely, take endless repositioning. Items (F) and (G) magnify.
 - Chrome plated handles with vinyl insulating grips.
 - Copper-backed mirrors.
- Use in any position for accurate inspection of hidden areas. Speed work flow tremendously. Telescoping models have hex inner rods . . . won't rotate.

Item	Arm Size	Mirror Size	Stock No.	Price Ppd.
(A)	7"-13"*	2 1/4"	60,014	\$2.75
(B)	7"-12"*	3 1/2" x 2"	60,010	3.00
(C)	6"	1" x 2"	60,012	1.65
(D)	8"	1 1/4"	60,013	1.65
(E)	7"	3/4"	60,011	1.50
(F)	10"-14"*	2 1/4"	60,511	4.15
(G)	7 1/2"***	7/8"	60,510	2.25

(H) Penlight Mirror. 1 1/4" mirror, 5/8"-I.D. slit-sleeve mount. (no penlight). **No. 60,512 \$2.15 Ppd.**

(I) 2 1/4" x 3 1/2" Mirror on Magnetic Base. Two ball joints, Alnico magnet. **No. 60,015 \$7.15 Ppd.**
* Telescoping handle. ** With pocket clip.

DENTAL INSPECTION MIRRORS

Will withstand extreme temperatures. Used to inspect hard-to-see places inside machinery, etc. Handle length 6 1/2". Approximately 1 1/2" diameter.
Standard. **No. 60,004 \$1.25 Postpaid**
Magnifying. **No. 60,005 \$1.50 Postpaid**

REGULAR MIRRORS ON FLEXIBLE BACKING

For covering jewel boxes, picture frames, etc., 6" x 6" sheets can be peeled for individual use, or cut in rows to form convex or concave strip mirrors. "Wiped" to eliminate sharp edges. Last three are excellent for studies in reflection of light. No. 60,245 meets specifications of No. 2685 in the CCSSO guide for NDEA purchase.

Mirrors	Size	No.	Price, Ppd.
144 mirrors	1/2" x 1/2" on 6" x 6" sheet	60,239	\$1.25
72 "	1/2" x 1" on 6" x 6" sheet	60,240	1.25
36 "	1" x 1" on 6" x 6" sheet	60,241	1.10
18 "	1" x 2" on 6" x 6" sheet	60,242	1.10
10 "	1 1/2" x 1 1/2" on 6" x 6" sheet	60,243	1.10
9 "	2" x 2" on 6" x 6" sheet	60,244	1.10
1 mirror	4 x 15cm (1 5/8" x 6")	60,245	.20
1 mirror	10 x 10cm (4" x 4")	60,246	.30
1 mirror	10 x 15cm (4" x 6")	60,247	.60

Special! CONVENTIONAL (Back Surface) MIRRORS

Size	Comments	No.	Price
1 5/8" x 2 1/8" x 1/8"	Cut corners, gold	571	\$0.50
1 3/8" x 2 3/8" x 1/8"	Cut corners	40,914	.75
2" x 2" x 3/32"	Pkg. of 8	P-40,481	1.00

SAFETY AND THEFT PREVENTION MIRRORS



Convex in shape they give a wide angle of view. Intended for indoor use, they have a Masonite back, and mounting brackets are included.

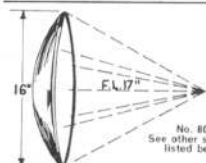
No. 19,001 Diam. 13"	\$12.00*
No. 19,002 Diam. 18"	20.75*
No. 19,003 Diam. 26"	32.50*
No. 19,004 Diam. 36"	60.00*

Rubber mounted mirrors for outdoor use at slightly higher prices, flat glass and metal mirrors, write for our Bulletin 51. *Trans. Chgs. Coll.

POWERFUL SEARCHLIGHT (MANGIN) MIRRORS

A mangin mirror is glass ground and polished on both sides but with radii of curvature so calculated as to cause reflected light to leave reflector in an intense parallel beam. Silvering is on rear surface. No holes are drilled in these mirrors. Excellent for spotlights, reconditioning antique auto headlamps, etc.

Diam. 2 3/4", F.L. 3 3/2"	No. 41,007	\$1.50 Ppd.
Diam. 5 1/2", F.L. 2 1/4"	No. 70,080	\$5.00 Ppd.
Diam. 8", F.L. 3 1/2"	No. 70,083	\$7.00 Ppd.



BIG GLASS CONCAVE MIRRORS

Large, second surface, concave mirrors that give approx. 2X magnification. See everything as a close-up image. Gang several and focus sun's rays to create super hot

solar furnace. Excellent for shaving and make-up mirrors, examining tool cutting action or anything where magnified close-up image is helpful.

Stock No.	Diam.	Approx. F.L.	Weight	Price Ppd.
60,616	6"	16"	4 oz.	\$1.65
60,617	8"	19"	10 oz.	3.50
70,671	12"	20"	1 1/4 lbs.	5.00
80,097	16"	17"	6 lbs.	10.00

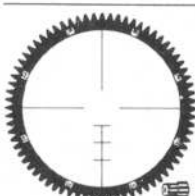
SECOND SURFACE, CONCAVE MIRRORS

No.	Size in Millimeters	Focal Length	Notes	Price Ppd.
40,289	12	62mm		\$0.75
40,292	40	67mm		.75
40,394	76	250mm		1.00
60,133	154	55mm		5.50

SURPLUS PARABOLIC REFLECTOR, 1/4" F. L.

Well made of heavy brass, highly polished and rhodium plated. Measures 2 5/8" diam. x 1 1/2" deep; center hole 3/8" diam.

No. 60,556 \$1.00 Ppd.



LARGE GLASS RETICLE IN GEAR MOUNT

Government surplus, 1/8" thick glass reticle, with 9 3/4" clear aperture, measures 9 3/4" overall. Etched, .020" cross lines, filled with white, leave 2 1/4" clear area in center of field.

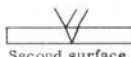
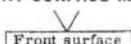
Metal clamps hold reticle to black anodized, ring gear mount. Mount has 328 teeth, 1/8" thick, 32 pitch, 20° pressure angle. Measures 10 3/4" wide, 3 3/8" thick over clamps. A 10 tooth 3/8" diam. brass pinion (fits 1/8" shaft) is supplied to rotate mount. Instructions included.

No. 70,841 \$20.00 Ppd.

Build Giant Size Variable Density Unit

Buy two No. 70,841 (above) and two No. 70,419 10" x 10" polarizing sheets (pg. 86). Build polarizing demonstrator, polarimeter or unit for photography.

FRONT SURFACE MIRRORS



A front surface mirror is a mirror whose surface nearest the object to be viewed has been aluminized. Light is reflected from this near surface with no refraction. A second surface mirror, the conventional type, reflects light from its back or far surface. Refraction occurs in a second surface mirror, as shown by sketch.

FRONT SURFACE MIRROR LISTINGS

No.	Size Mms.	Thickness	Notes	Price Ppd.
40,279	7.5 x 11.5	1.0		\$0.75
40,238	8.5 x 19	1.3		.75
40,281	9 x 10.5	1.0		.75
40,282	9.5 x 49	3.2		.75
40,284	13 x 25	6.0		.75
30,546	14.5 x 19	1.75		.75
40,286	19 x 25	4.6		.75
30,428	19 x 25.5	3.2		.75
30,286	25 x 35	5.5 (Flat to 1/4 wave.)		2.00
30,429	26 x 40	3.2		.60
41,052	32	25		1.25
41,051	33	21		1.00
41,053	35	38		1.00
30,544	38 x 25	2.5		.75
30,545	38 x 61.5	2.5		.75
30,465	40.5	5		1.00
41,054	52	38		2.50
589	59	1.0		1.00
40,773	57 x 68.5	2.5		.90
40,401	57 x 86	2.3		1.10

No.	Size in Inches	Approx. Thickness	Notes	Price Ppd.
26	1 1/4	1/8	Round	\$0.75
595	1 1/4	1/8	Rd., plastic mt.	.75
535	1 1/4 x 1 1/4	1/8	Corner cut	.75
591	1 1/4 x 1 1/4	1/8		.75
547	1 1/4 x 5 1/4	1/8		1.00
40,040	2 x 3	1/4		.90
40,324	2 1/2 x 3	1/8		1.25
30,209	2 5/8 x 3 1/4	3/8	Alum., Overcoated	4.00
40,041	3 x 4	1/4		1.50
40,042	4 x 5	1/4		2.10
40,043	5 x 7	1/4		3.15
40,067	8 x 10	1/4		6.00
85,036	10 x 14	1/4		*12.50

*Transportation charges collect.

FRONT SURFACE, CONCAVE MIRRORS

No.	Size in Mms.	F. L.	Notes	Price Ppd.
40,291	9.5	101	PCV Alum. on plano	\$1.50
40,299	27.5X	33.5	2.5	1.00
30,507	28.5	11		.75
566	35	15	Metal	.75
40,886	51	22	Glass	2.00
572	54	24	Gold reflecting	1.50
70,169*	172	98		15.00

*70,169 was made for use in a Schmidt-type television system. Circle in center of mirror was not polished and is only 1/8" thick x 1 3/4" diam. Pyrex, 3/8" thick.

See Complete Mirror Grinding And Polishing Kits, including blank, tool and abrasives for 4 1/4" to 12 1/2" diam. mirrors, page 129.

ASTRONOMICAL TELESCOPE MIRRORS

No.	Diam.	F.L.	Thickness	Price
40,913	2 1/2"	25"	3/8"	\$4.00 Ppd.
30,219	3"	18"	3/8"	7.65 Ppd.
50,082	3"	30"	3/8"	7.65 Ppd.
50,051	4 1/4"	45" Pyrex	5/8"	21.00 Ppd.

PARABOLIC PYREX MIRRORS

* Transportation Charges Collect

No.	Diam.	F.L.	Thickness	Price
5002	6"	48"	1"	\$ 59.50 Ppd.
85,069	8"	64"	1 3/8"	89.00* T.C.C.
85,070	10"	80"	1 3/4"	179.00* T.C.C.
85,071	12 1/2"	100"	2 1/8"	275.00* T.C.C.

FRONT SURFACE ELLIPTICAL MIRRORS

Ground and polished; aluminized and overcoated.



Flatness	Size	No.	Price Ppd.
1/4 wave	7/8" x 1 1/4" x 1/4"	30,259	\$3.50
1/4 wave	1 1/4" x 1 1/4" x 1/4"	30,260	3.75
1/4 wave	1 3/4" x 1 1/4" x 3/8"	30,188	3.75
1/8 wave	1 3/4" x 1 1/4" x 3/8"	30,205	5.00
1/4 wave	1 1/2" x 2 1/8" x 3/8"	30,258	5.75
1/4 wave	1 7/8" x 2 3/32" x 3/8"	30,261	12.00

See Without Being Seen

TRANSPARENT FRONT SURFACE MIRRORS

Someone looking into this glass "mirror" sees only an image of himself, totally unaware that he is being watched. Light on the observer's side should not be too bright. Hard chromium surface. Thickness 1/4".

No. 40,044	Size 2" x 3"	\$0.60 Postpaid
No. 40,045	Size 3" x 4"	1.10 Postpaid
No. 40,046	Size 4" x 5"	1.80 Postpaid
No. 40,047	Size 5" x 7"	3.15 Postpaid

See One-Way Mirrors of Plastic Film, Page 61.



SURPLUS, GLASS OPTICAL DOMES

Built to rigid govt. specifications. Optically ground and polished on both surfaces, unmounted. Limited stocks available.

Glass Dome 1 1/2" high x 3 5/8" max. diam. x 1/8" thick.

No. 41,009 \$9.00 Ppd.

Glass Dome 1 1/2" high x 4 3/4" max. diam. x 1/8" thick.

No. 60,660 \$10.00 Ppd.

See 12" and 20 1/2" Plastic Domes described on page 11

LARGE FILTER WHEEL

Surplus bargain! Brass wheel is 5 7/8" diam., 1/8" thick with 3/8" diam. center hole. Contains 4 filters, one red type "A," one dark yellow, one clear, plus one variable density polarizing filter with gear, goes down to almost total extinction. Red, yellow and clear filters have a clear aperture of 35mm. Polarizing filter has clear aperture of 40.5mm. All filters, including polarizing, can easily be removed from wheel. Weighs 1 lb. 2 ozs.



No. 60,145 \$4.00 Ppd.

Small Filter Wheel. Four 3/4"-diam. neutral filters (shades from light to dark) in 1 3/8"-diam. mount with 1/4" center hole. **No. 40,607 \$2.00 Ppd.**

OPTICS - PRISMS



PORRO PRISMS

These are right angled prisms usually with a groove on the hypotenuse. Two, used together, erect an image from an objective lens (binocular, telescope, etc.). They also enable shorter instruments to be designed without reducing the length of the light path.

7X50 BINOCULAR ERECTING PRISM CLUSTERS... Only \$4.50

Complete prism assembly ready to mount on your telescope, microscope and other optical systems to give you an erect image. Consists of 2 porro prisms fastened to a prism shelf. Clear aperture is 1". Made for 7 x 50 govt. binoculars and sold at far below the original cost. Approx. Govt. cost \$20.00.

Right Side **No. 50,187 \$4.50 Postpaid**
Left Side **No. 50,188 \$4.50 Postpaid**



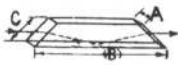
BINOCULAR REPLACEMENT PRISMS ONLY.

Binocular	Prism Sizes, mm	Coated	No.	Price
7 x 50	B-51.5, C-35, A-25	Yes	5114	\$2.00 Ppd.
6 x 30	B-43, C-26, A-21	Yes	5211	2.00 Ppd.

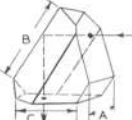
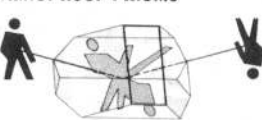
DOVE PRISMS

If you look through the prism and rotate it about a longitudinal axis, the image rotates through an angle twice as much as the prism. Excellent for trick movies.

No.	B	C	A	Price, Ppd.
40,885	41	13	8	\$1.50
3311	36	19	10	2.50
3050	49	17	12	2.75
40,605	67	30	22	4.00
3241	90	38	40	9.50



AMICI ROOF PRISMS

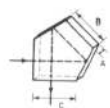
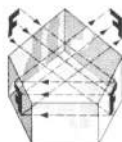


These are Amici Prisms, also called "roof prisms" and "right angle prisms with roof." They do two things: erect the image and bend the line of sight through a 90° angle. Excellent as prism diagonal in refractor astronomical telescopes as they erect the image permitting use of the telescope for terrestrial viewing. In spotting scopes they make viewing possible by merely turning head to one side. Use wherever desirable to take the upside down image from the objective, turn it right side up and bend it through a 90° angle and still have left and right correct.

Stock No.	B	C	A	Comments	Price, Ppd.
3088	13	11	10	Corrected roof 120° angle	\$2.00
3106	16	15	14	Corrected roof.	2.50
3172	34	20	18		1.00
3038	34	20	18	Corrected roof.	2.50
3003	41	21	22	Corrected roof.	3.50
3002	41	21	22		1.50
3225	48	33	36	Corrected roof-80° angle instead of 90°	6.50

PENTA PRISMS

Penta is a five sided prism. It reflects light rays through an angle of 90° by two reflections. It does not invert or revert the image. The reflecting surfaces are silvered. Slight movement of the prism does not affect the true right angle at which light rays are reflected. This feature makes this prism useful in rangefinders. It also shortens the length of an instrument. Excellent for use in front of movie camera lens for taking shots off to the side without subject's knowledge. (Still cameras can use a right angle prism for this purpose.) All sizes in the table below are given in millimeters.



Number	B	C	A	Comments	Price, Ppd.
30,355	4	8	8	Silvered	\$4.00
40,622	15	27	25	Silvered	6.50

PENTA PRISM WITH HANDLE



Use this mounted, war surplus penta prism as an optical square. Bends rays of an image in a right angle, maintaining the right angle no matter what position the eye takes with respect to the prism. Useful in surveying, aligning fixtures, planning of roads or gardens. Silvered. Dimensions: B-15mm., C-27mm., A-25mm.

No. 60,614 \$7.50 Ppd.

GIANT PENTA PRISM

One of the largest penta prisms we have ever seen. Beautifully made, silvered and coated. Gives right angle viewing with no change in the image.

Should be nice for television stations or photographers who often take pictures at right angles. Entrance and exit faces are 57mm square. Size B-31mm, C-57mm, A-57mm.

No. 50,186 \$39.50 Postpaid

PENTA ROOF PRISM

Faces 36 x 28mm; 50mm long. Silvered and coated.

No. 3259 \$5.00 Ppd.

MISCELLANEOUS... FOR EXPERIMENTERS

Porro Prism System. Entrance faces measure 21 x 21mm.

No. 30,279 \$4.95 Ppd.

Pentagon Prism. 24 x 28 x 9mm

No. 3210 \$1.50 Ppd.

Small 72°. B-9, C-8mm., A-7

No. 3138 \$2.00 Ppd.

Cube Prisms. Polished on four sides.

No. 3305 \$1.25 Ppd.

6.7 x 7.6mm high.

No. 3293 \$2.50 Ppd.

13.5 x 9.4mm high.

No. 3288 \$1.25 Ppd.

Octagon Prism (8 faces) 7.9 x 5.5mm. Diameter 13.5mm.

No. 3006 \$.50 Ppd.

For 8mm movie editors.

No. 3286 \$1.00 Ppd.

Porro-Abbe. 9 x 12mm.

No. 3070 \$.60 Ppd.

Light Pipe. 5 x 5, 2.5 x 2.5 x 48mm.

No. 3307 \$2.00 Ppd.

Rangefinder Ocular Assembly

No. 3296 \$1.50 Ppd.

Boreoscope. 13 x 13 x 43mm. Mtd.

No. 3219 \$3.00 Ppd.

80-50-50° Prism. 16.5 x 17 x 14mm.

No. 3258 \$3.00 Ppd.

Porro Prism. Tapered B-60, C-39mm, A-22

No. 3258 \$3.00 Ppd.

Rhomboidal Prism. 24 x 26 x 35mm.

No. 3258 \$3.00 Ppd.

See Front-Surface Mirror Listings, page 89

SPECIAL SALE! GIANT AMICI ROOF PRISM AT A LOW, LOW PRICE

Government cost about \$80.00, you can now buy it in a beautiful brass mount.

You can use it in many ways... for making a homemade telescope, to project 35mm slides or movies on the ceiling for a bedfast patient. Make an excellent contour projector, or use it as a star diagonal on refracting telescopes to

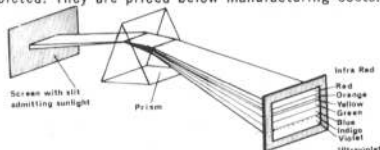
get a rightside-up image. Excellent as a demonstrator for schools, museums. Bends light 90° and erects image. Wt. 1 lb. 2 oz. Size (without mount) B-53mm, C-36mm, A-40.5mm. Clear aperture of prism in mount is 32mm. Heavy brass mount is easily removable.

No. 70,826 \$11.50 Ppd.



WHAT ARE PRISMS?

Prisms are transparent bodies, usually glass, with polished surfaces from which light is reflected or through which light is refracted. By manufacturing them in different shapes and combinations they can be made to accomplish almost any requirement. Normally few prisms are available from stock and they are expensive to manufacture. Their use expands greatly in war time. We have a large variety of war surplus ones available until our stock is depleted. They are priced below manufacturing costs.



RIGHT-ANGLE PRISMS



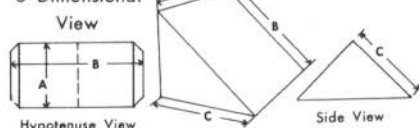
The right-angle prism is the most commonly used prism. It is used when a deviation of -90° is desired. While the relative positions of the top and bottom of the image will be the same, the right and left sides will be interchanged. The drawing at the left shows a right angle prism and how the image is reversed as to left and right.

Right Angle Prisms are used:

1. In astronomical telescopes as the diagonal.
2. In front of still cameras to take pictures to the side without subject being aware you are photographing him.
3. In instruments to turn a beam of light through 90° .
4. In front of a dial, etc., to aid in viewing.
5. On top of a microscope eyepiece to project images on wall, screen or other vertical surface.
6. As porro prisms in binoculars and telescopes.
7. By cementing two together to make a beam splitter.
8. To project a spectrum.
9. In front of projector lens to project image on ceiling for bed patients, and to correct image when projecting behind a screen.
10. In such items as Rangefinders, Photo-Electric Systems, Auto-Collimator, Bore-sights, Contour Projectors, Sextants, Transits, Spectroscopes, Opaque Projectors, Periscopes and Photostat Cameras.
11. When silvered, this usually appears on the base.

HOW TO ORDER THE SIZE YOU NEED

3-Dimensional



For your convenience the above three drawings will help you to visualize the sizes of prisms included in this catalog. B=length of base; A=face of prism; C=length of face.

RIGHT-ANGLE PRISMS AVAILABLE

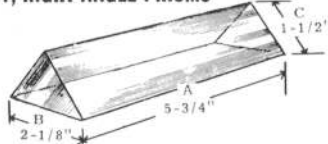
Some are slight seconds, some are perfect . . . all are at bargain prices. Dimensions B, C and A are given in millimeters. Please read above "HOW TO ORDER THE SIZE YOU NEED."

No.	B	C	A	Comments	Price, Ppd.
30,580	7	6	6	1mm. cut off base	\$1.25
30,578	8	6	6		1.35
30,579	8	6	6	Silvered	1.50
30,575	8	7	7		1.00
41,012	17	12	16		2.25
30,576	18	13	13		1.75
41,008	19	12	11		2.25
3301	21	15	15		2.25
3309	21	15	15	Silvered	3.00
30,526	21	15	15	Silvered; lens surface prism F.L. 30mm 15mm cut off base	2.50
40,733	23	20	37		2.00

RIGHT-ANGLE PRISM LISTINGS (Continued)

No.	B	C	A	Comments	Price, Ppd.
40,867	24	18	18	Silvered	\$2.50
30,577	25	19	19		2.00
40,604	29	20	21		3.00
30,732	30	19	13	Miniature porro prism	1.75
40,995	36	25	25		2.50
60,455	38	27	30	Coated	5.00
30,57	42	27	20		2.00
40,865	43	29	20	Round corners	4.00
3312	43	27	20	Silvered; round corners	1.75
41,002	43	31	31		3.25
3224	44	33	30	Lens Surface Prism, F.L. 166mm	3.00
40,606	48	27	16	Silvered	2.00
3273	49	35	32	Light flint glass	4.25
3255	49	35	38	Cut corners	4.00
3073	49	35	25		2.00
40,866	53	35	25	Round corners	3.00
41,003	53	38	38		5.00
804	53	38	102	Second grade; plain	2.75
805	53	38	102	Second grade; silvered	2.25
801	53	38	146	Best grade; plain	3.95
800	53	38	146	Best grade; silvered	3.25
808	54	38	28		1.50
3274	54	38	28	Silvered	1.50
809	54	38	38		2.00
3275	54	38	38	Silvered	2.00
3253	54	38	38	Two faces aluminized	3.00
3147	55	38	26	Silvered	1.75
3169	57	40	41	Light flint glass	5.00
810	69	49	54		4.50
3249	69	49	54	Silvered	4.50
807	69	49	167	Coated; mounted	8.50
806	69	49	167	Second grade; silvered	6.00
41,004	71	51	51	Silvered	12.50
40,718	72	42	33	Cut corners on face	3.00
3276	76	55	38	Light flint glass	3.50
60,649	89	63	63		19.00
3076	91	64	41	Light flint glass	6.00
60,650	108	76	76		24.00

GIANT, RIGHT-ANGLE PRISMS



These are 90-45-45° prisms. Finely ground and polished. Used by the Army in tank periscopes. Normally, prisms like this would retail for \$15.00 to \$60.00. May have chips and minor flaws. All are size B-53, C-38mm, A-146.

One of the most interesting experiments you can make with a plain prism is to use it to project the spectrum. They are useful for experiments, classroom demonstration at high schools, colleges, camera clubs, etc.

Best Grade Silvered Prism.	No. 800	\$3.25 Postpaid
Best Grade Plain Prism.	No. 801	3.95 Postpaid
Second Grade Silvered Prism.	No. 802	2.25 Postpaid
Second Grade Plain Prism.	No. 803	2.75 Postpaid

Make a Prism Nameplate for your desk. Set of 150 gold-colored letters. **No. 40,588 15c Ppd.**

OTHER GIANT, RIGHT-ANGLE PRISMS

No.	B	C	A	Comments	Price Ppd.
804	53	38	102	Second, plain	\$2.75
805	53	38	102	Second, silvered	2.25
806	69	49	167	Second, silvered	6.00
807	69	49	167	Coated, mounted	8.50

FUNDAMENTALS OF OPTICAL ENGINEERING

By Donald H. Jacobs
Shows how mechanical design and optical design are inter-related. Both these subjects are based on rather simple principles, a basic knowledge of which is sufficient to carry one through the most difficult problems. 487 pages. (6 1/4" x 9 1/4"). **No. 9201 \$11.25 Postpaid**

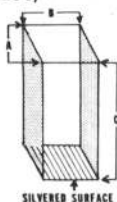
OPTICS-MISCELLANEOUS

LARGE RHOMBOIDAL PRISM (SURPLUS)

This precision optical prism displaces the light path (image) according to the length (56mm). Image position remains parallel to the old line of sight. Image is neither reverted or inverted. Rear of one face is silvered.

Precision made. Use to vary interpupillary distance on binocular instruments, make camera stereo adapters, stereo viewers, etc. Size: A-32, B-30, C-56.

No. 40,816 \$7.50 Ppd.



LOW-COST, 60° EQUILATERAL PRISMS

Flint glass, pitch polished, quality prisms for school use.

No.	Face Size	Length	Glass	Polish	Price Ppd.
30,294	1"	2"	Flint	Pitch	\$1.75
30,295	1"	3"	Flint	Pitch	2.75
30,296	1"	4"	Flint	Pitch	3.75
30,297	1"	6"	Flint	Pitch	5.50

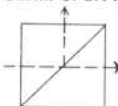


LARGE, MOUNTED, PRISM

Gov't. Surplus, this is an unusually large, coated, dove-type prism, in metal mount. When rotated on longitudinal axis the image rotates at twice speed of prism. Useful for special photographic effects.

Can be cut to make two large 60° prisms. Surfaces, better than 1/2 wave. Faces measure 66 x 79mm, 78 x 79mm, hypotenuse (unsilvered) 144mm. Weight 5 lbs. **No. 70,929 \$75.00 Ppd.**

BEAM SPLITTERS... PRISM TYPE



A prism beam splitter consists of two right angle prisms cemented to form a cube. Sometimes one hypotenuse is partially aluminized. When you look into a beam splitter you see straight ahead as well as at a right angle. Transmission 30%. Reflectivity 30%. Approx. 40% of the light is absorbed by the reflectance coating.

Size 10mm. cube.	No. 30,478	\$5.00 Postpaid
Size 15mm. square	No. 30,329	5.00 Postpaid
Size 20 x 29mm.	No. 40,887	7.00 Postpaid
Size 25mm. cube.	No. 40,996	6.50 Postpaid
Size 49 x 53mm.	No. 60,273	15.00 Postpaid

MIRROR-TYPE BEAM SPLITTER... REFLECTS 1/3

This is a nonabsorbing beam splitter that reflects approximately 1/3 of light and transmits the remainder. Very neutral in color characteristics. Interference coating is extra durable. Glass is parallel to 20 seconds, in most cases, and surface is flat to 10 rings. Size 67 x 83mm.

No. 578 \$4.00 Ppd.

Size 57 x 74 x 4mm thick.

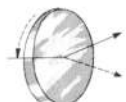
No. 40,921 \$4.00 Ppd.



SMALL MIRROR-TYPE BEAM SPLITTERS

Stock No.	Size	Thickness	Comments	Price Ppd.
40,235	5 x 92mm	1.3mm	Mult. layer coat	\$1.00
40,217	7 x 9.5mm	1mm		1.00
40,236	9 x 19mm	1.3mm	Mult. layer coat.	1.00
30,462	7.5 x 20.5mm	1mm		1.00

Fiber Optics Light Guides, Utilizing Glass and Plastic Fibers, Image Conduits, Fiber Optics Experimental Kits, see pages 87, 94.



WEDGES

Wedges divert path of light by refraction. Used where the angle of diversion required is very small.

Wedge Lenses

Stock No.	Diameter	F.L.	Deviation	Price Ppd.
3233	31mm	220mm	5.2°	\$2.25
3234	27mm	310mm	5.2°	2.00
30,435	28mm	4031mm	2°	2.00

Brass-Mounted Wedge Window With 3/4" Clear Aperture. Rotates 360° in 5" diameter mount with 60° reference scale. Deviation 60 seconds (angle 116 sec.). Glass is borosilicate crown; $n=1.512$, $v=64.5$.

No. 50,069 \$8.00 Postpaid



OPTICAL, MULTI-LAYER DIELECTRIC INTERFERENCE FILTERS...

High Quality Filters Designed For Use With Osram or Other Mercury Vapor Lamp

When electrical excitation is applied to mercury vapor lamps, spectra are emitted. The function of each filter is to single out one particular spectral line for use or study. Each filter is labeled for wavelength. Transmission curves included. Typical applications are measurement of the index of refraction, studies in interference, reconstruction of holograms used in spectrographic and photometric analysis.

Passband Characteristics: have a total width at half peak transmission of approx. 100Å
Peak Tolerance: within +30 -10Å
Peak Transmission: approx. 25 to 60%
Sideband Blocking: transmission outside bandpass is less than 0.1%.

Mercury Wavelength	Stock No.	Price, Ppd.
4046.6Å	30,595	\$13.00
5460.7Å	30,596	13.00
5790.7Å	30,597	13.00
6234.4Å	30,598	13.00
6907.5Å	30,599	13.00

Above set of five interference filters in fitted, leatherette covered box.

No. 41,061 \$60.00 Ppd.

MULTI-LAYER DICHROIC INTERFERENCE FILTER

Use this large, circular filter 11 1/4" in diam. (usable diam. 10") x 3/4" thick in any number of highly specialized beam splitter applications. Actually a sandwich of two 1/4"-thick pieces of glass (one with 5-layer interference coating) with 4 thin layers cemented between—2 gelatin, 1 plastic and 1 neutral density filter. Transmission of red light approx. 20%; reflection of blue light 60%. Weight 2 1/2 lbs. War Surplus Bargain.

No. 70,839 \$25.00 Ppd.

REFLECTION-TYPE INTERFERENCE FILTER

This War Surplus 115 x 65 x 6mm-thick filter in aluminum mount is peaked at 450 milli microns. Reflects 40% of light at 400 milli microns wave length, 94% at 500 and 48% at 600; with back scraped (for use as transmission-type filter) transmits 40%, 5% and 48% respectively. Mount 6 3/4" x 4 3/4" x 3/8" thick has three 7/32" diam. mounting holes.

No. 40,919 \$5.00 Ppd.

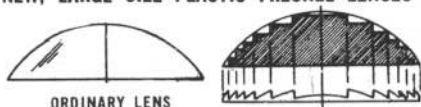
"COLLIMATION AND COLLIMATORS"

This comprehensive yet easily understood booklet describes different kinds of collimators including alignment, zero (hand), projector, folded type, fixture type, off-axis pinhole type, basic auto collimators and others.

Chapters cover angle accuracy, tests for flatness, parallelism, alignment, displacement, tilt, parallax, resolution, azimuth (horizontal) angles, etc., plus test hints. Well illustrated with approx. 50 drawings, this 36-page, 8 1/2"x11" booklet is an important addition to Edmund's Popular Optics Library.

No. 9072 \$1.00 Ppd.

NEW, LARGE SIZE PLASTIC FRESNEL LENSES



ORDINARY LENS

FRESNEL LENS

A Fresnel lens is a flat, thin piece of plastic on which has been molded a series of small, concentric stepped zones. They extend from center to outer margin. Each groove is a minute refracting facet capable of bending light. Its transmittance (ability to pass light) is greatly increased over that of a conventional lens of the same focal length. Thus a large diameter, lightweight and inexpensive lens with a short focal length is possible.

FRESNEL LENSES HAVE COUNTLESS USES

- (1) **Solar Energy Furnaces** . . . See Page 30.
- (2) **Burning Glasses.** Will start newspaper burning in less than 1 minute!
- (3) **Ground Glass Image Brighteners.** Easily cut to needed size. Place behind ground glass in view cameras, contour projectors, rear view projector screens, rear illuminated color transparencies, etc. Intensifies the light producing brighter images at outer edges.
- (4) **Condensing Lenses.** Widely used in overhead projectors. Combine two to get better results and shorter focal lengths. Glass condensers with these diameters and F.L.'s would cost 5 to 10 times as much, if available. Use on low heat optical systems such as cold light enlargers, etc.
- (5) **Large Area Magnifiers.** Large size magnifiers are heavy and expensive. Fresnel lenses do not give as clear an image as glass, but they are suitable for many large area magnification jobs. Use in advertising displays, for industrial assembly jobs, etc.
- (6) **TV Screen Magnifiers.** Widely used at one time for magnifying screen images. If you want to increase the size of your TV screen's image, consider one of these.
- (7) **Trick Photography.** See article on high speed photography in July, 1964 "Scientific American."

Size	Thick- ness	Focal Length (approx.)	Lines/In.	Stock No.	Price, Ppd.
*2 1/4" x 2 1/8"	1/8"	3"	400	30,389	\$2.49
3" x 3 3/4"†	.078"	9 1/2"	88	40,709	4.50
6" x 5 1/2"†	3/32"	8 1/2"	64	40,803	6.50
7 1/2" x 9 3/4"†	3/32"	20"	80	60,671	6.50
6" sq.	.118"	10"	110	40,954	6.50
9 7/8" x 7 5/8"	.080"	11 3/4"	104	60,498	6.50
10 1/2" sq.	1/8"	5"	60	70,669	12.00
10 1/2" sq.†	1/4"	13 1/2"	60	70,670	6.00
11" sq.	3/32"	8"	50	70,879	12.00
11" sq.	3/32"	8 1/2"	50	70,880	12.00
11 1/8" sq.	1/8"	19"	60	70,533	6.00
11 3/4" sq.	.080"	16"	50	70,877	6.00
11 3/4" sq.	.080"	18"	50	70,878	6.00
11 3/2" x 14 1/2"	.039"	21"	80	70,673	6.00
16 1/8" x 11 3/4"	.110"	19 3/4"	80	60,500	7.50
21 1/8" x 16 3/8"†	.125"	24 3/4"	80	70,716	14.10
24 3/4" x 19 1/4"†	.125"	24 3/4"	80	70,717	21.50

Note: Lens No. 70,673 is tinted blue. (Lenses marked †) have cut or rounded corners. Lens marked (*) is specially designed for use over ground glass of twin lens reflex camera . . . brightens image, makes composition easier. Clear spot, 3/8", in center for magnifier.

NEW GIANT FRESNEL LENS, 24 3/4" x 19 1/4"

This new giant size now makes possible larger overhead projectors and solar furnaces with higher BTU output. Thickness .125" thick. F.L. 25". Rounded corners.

No. 70,717 \$21.50 Ppd.

GIANT FRESNEL LENS . . . 42" DIAMETER

These are rejects from special orders. 45" diameter with 42" active area. 1/4" thick. Mounted between two pieces of plexiglass. Just a few available: 30" F.L. Shipped F.O.B. from New York.

No. 19,076 \$700.00

GROUND GLASS

This is glass that has been finely ground on one side to give good light diffusion. Excellent for camera viewing screens, rear projection screens, enlargers, etc.

No.	Size	Thickness	Comments	Price, Ppd.
30,456	1 3/8" x 2"	1/8"		\$0.65
2143	2 1/4" x 3 1/4"	1/16"		.50
2144	3 1/4" x 4 1/4"	1/16"		.65
2148	4" x 5"	1/16"		.65
60,119	4 7/8" x 6 7/8"	3/32"	1/4" squares	1.00
2146	5" x 7"	1/16"		.90
60,120	7 1/4" x 7 3/16"	3/32"		1.00
2147	8" x 10"	1/16"		1.25

See Page 111 for other Rear Projection Screens

1/4" SQUARE RULED, GROUND GLASS SCREEN



Size: 4 7/8" x 6 7/8", 3/32" thick. Entire surface is ruled in 1/4" squares. Lines are ruled on ground side. .010" thick. Use on 5 x 7" view camera to measure image size, inspection projectors, etc.

No. 60,119 \$1.00 Postpaid

OPAL DIFFUSING GLASS

Similar to ground glass listed at bottom of left column, but one surface of this is flashed with opal covering. This is milky white and it evenly diffuses light. 4" x 5" x 1/8" thick.

No. 2149 \$1.00 Postpaid

FLAT GLASS

War surplus circular pieces of optically flat glass, ground and polished with both sides parallel. Because they were made for instrument reticles, telescope windows, etc. they had to be good. Expensive to produce, they cost the U. S. Government \$2.00 and more apiece. Use for instrument windows, filters.

Stock No.	Diameter in Mms.	Thick. Mms.	Stock No.	Diameter in Mms.	Thick. Mms.
The Following 50c Each			The Following 75c Each		
2073	5.1	2	40,256*	30	3
2074	5.1	1	30,454	37	3
2075	6.9	1	30,451	37	6
2187	8.2	2	2184	38	3
40,216	9	7	2207	40	1
40,221	10	2	2208	42	3
2105	13	2	2195	52.5 x 126.5	13
2080	16	3	2209	53 x 113	7
2082	17	3	2069	54 x 75	3
2098	18 x 18	2	2191	57.5	6
30,469	18.5 x 12	2	40,262†	57 x 74	4
2083	19	2	2154	58	6
2203	21	1	The Following \$1.00 Each		
2084	21	2	2198	62.5 x 139.5	9
2099	21 x 46	3	2070	63	3
2159	22	3	40,255*	66 x 215	8
2205	22 x 28.5	4	*Coated †Cut Corners		
30,500	24 x 34	3			
2206	27	2			
2199	27.3	1			
2089	27.4	3			
2186	29	3			
2091	30	2			
30,504	48 x 76	2.3			

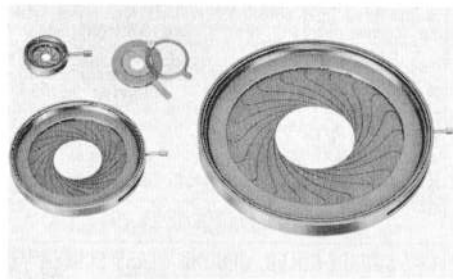
MISCELLANEOUS FLAT GLASS LISTINGS

Stock No.	Diameter	Thickness	Price, Ppd.
30,581	13mm	3mm	\$0.50
2085	22mm	2mm	.30
30,582	34mm	3mm	.75
2155	98mm	7mm	2.50
60,055	150 x 192mm; L. O. F. Twin Polished Glass	6mm	1.50

OPTICAL QUALITY PLATE GLASS

Stock No.	Size	Thick.	Price, Ppd.
30,495	1 1/8" x 1 1/8"	7/32"	\$0.50
60,311	3 1/8" x 4 1/4"	3/8"	.75
60,312	3 3/8" x 5 3/4"	3/8"	1.00

PRECISION, LOW-COST IRIS DIAPHRAGMS FOR OPTICAL INSTRUMENTS



This series of eight, German-made iris diaphragms cover the most commonly required sizes. No. 30,263 is a hard-to-find miniature, Nos. 40,997 and 40,998 have a threaded shoulder, to attach to microscope substage, and

swing-in filter holder below the iris.

These diaphragms, designed for instrument use, can be attached to cameras, enlargers, projectors, illuminators, optical benches, etc., wherever a variable aperture is necessary.

Precision built, lever operated, iris leaves are made of blued spring steel. They operate exceptionally smoothly in black-finished, lightweight, aluminum mount.

Outside Diam.	Aperture Max.	Aperture Min.	Thick	Stock No.	Price Ppd.
25 $\frac{1}{2}$ "	15 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	13 $\frac{1}{2}$ "	30,263	\$4.00
12 $\frac{1}{2}$ "	6 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	6 $\frac{1}{2}$ "	40,997*	7.00
15 $\frac{1}{4}$ "	13 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	10 $\frac{1}{2}$ "	40,998*	7.00
24 $\frac{1}{4}$ "	15 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	17 $\frac{1}{2}$ "	30,118	6.00
31 $\frac{1}{2}$ "	26 $\frac{1}{2}$ "	5 $\frac{1}{2}$ "	23 $\frac{1}{2}$ "	30,264	14.00
52 $\frac{1}{2}$ "	43 $\frac{1}{2}$ "	15 $\frac{1}{2}$ "	37 $\frac{1}{2}$ "	60,644	21.00
87 $\frac{1}{2}$ "	67 $\frac{1}{2}$ "	9 $\frac{1}{2}$ "	61 $\frac{1}{2}$ "	70,894	40.00
111 $\frac{1}{4}$ "	85 $\frac{1}{4}$ "	23 $\frac{1}{4}$ "	74 $\frac{1}{4}$ "	70,895	70.00

*Can be used with microscope, see page 65.

INSTRUMENT QUALITY, 15,000-LINE GRATING

This low-cost replica grating is suitable for serious instrumental use. Made of glass, ground and polished to an optical surface and coated with aluminum. 15,000 lines per inch are then ruled on this surface. Less light

loss through absorption, and transmits ultraviolet light. Concave type—can be used in uncollimated light. Technical data included with each order. Size 3" diam. x $\frac{3}{8}$ " thick. Ruled area 1 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ ". Blaze wavelength 4000Å. Radius 100 cms.

No. 50,220 \$85.00 Ppd.

RONCHI RULINGS

ETCHED GLASS

All rulings are filled with baked-in, black opaque. Ronchi rulings are evenly spaced lines running parallel to each other. The width of a line is exactly equal to the width of the space next to it . . . a one to one ratio. When two rulings are placed in contact at right angles, the spaces between the lines become perfect squares. Typical applications include use in the printing and engraving industries to form halftones from photographic prints; use in the optics industry to make light gates, for testing lenses for surface flatness, also as a wavelength scale in a spectroscope; in the laboratory for measuring and calibrating with a microscope.

Also excellent for the production of Moiré patterns . . . see page 22. Also see the new HalfTone Screen Determiner on page 23.



*IMPORTANT NOTE

Rulings are 45° to the edge on all sizes with 80 through 150 lines per inch. Those with 200 through 300 lines per inch may be ruled either 45° or parallel to the edge. Please state choice, also whether other is acceptable in the event we cannot ship your choice.

1" x 1" Size

No.	Lines In.	Price, Ppd.
30,511	50	\$1.50
30,512	80	1.50
30,513	100	1.50
30,514	133	2.10
30,515	150	2.10
30,516	200†	2.10
30,517	250†	3.00
30,518	300†	3.00

† Sorry, no choice of ruling.

2" x 2" Size

No.	Lines In.	Price, Ppd.
40,650	50	\$6.00
40,652	80	6.00
40,654	100	6.00
40,656	133	8.40
40,658	150	8.40
40,660	200*	8.40
40,662	250*	12.00
40,664	300*	12.00

4" x 4" Size

No.	Lines In.	Price Ppd.
40,651	50	\$20.00
40,653	80	20.00

No.	Lines In.	Price Ppd.
40,655	100	\$20.00
40,657	133	28.50
40,659	150	28.50
40,661	200*	28.00
40,663	250*	40.00
40,665	300*	40.00

6" x 6" Size

No.	Lines In.	Price Ppd.
40,668	50	\$45.00
40,669	80	45.00
40,670	100	45.00
40,671	133	63.00
40,672	150	63.00
40,673	200*	63.00

ORIGINALS! 500-LINE RONCHI RULINGS

Actual original masters, metallic filled, on 1" x 2" glass. $\frac{1}{4}$ " thick! Innumerable uses, especially in the field of metrology. The 500-line rulings, a 50-50 ratio of black to clear, run parallel to the 1" edge . . . one line every .002" and accurate to .0002". Almost imperceptibly out of specifications (by less than .0001"), these rulings would ordinarily be worth much, much more.

No. 40,737 \$32.00 Each Ppd.

RONCHI RULINGS AND THEIR USES

Detailed, descriptive booklet covering their many uses in optics, printing, spectroscopy, etc. Ten pages (8 $\frac{1}{2}$ " x 11") paperback.

No. 9043 30c Ppd.



LOW PRICED, GLASS FIBER OPTICS EXPERIMENT KIT

Its profitable applications are endless. Use for illumination and inspection in remote, explosive or virtually inaccessible areas. With photocells, fiber optics help to count, select, detect, ignite, sort by size, shape or color.

Experimental Research Kit. Includes (A) and (B) Two "shoe strings", 0.20"-diam. bundles approx. 24" long sheathed in plastic with .032"-diam. stainless steel plugs on each end; (C) One $\frac{1}{8}$ "-diam. x 3-ft. incoherent flexible bundle in plastic jacket; (D) One $\frac{1}{4}$ "-diam. x 8" bundle of fine (.002"-diam.) loose fibers in storage tube; (E) Penlight-type light source with connecting adapter. Uses two "AA" penlight batteries (not incl.); (F) One $\frac{1}{8}$ "-diam. x 1" coherent rod in metal jacket; (G) One tapered point source, a metal-jacketed, 1 $\frac{1}{4}$ "-long tapered rod that funnels light to high intensity point; (H) One semi-scrambled block $\frac{3}{4}$ " x $\frac{3}{4}$ " x $\frac{1}{4}$ "; (I) One $\frac{1}{4}$ "-diam. x 8" bundle of coarse (.004"-diam.) loose fibers in storage tube. All in heavy-duty, plastic storage box. Complete instruction booklet.

No. 70,837 \$99.95 Ppd.

GLASS CHIPS WITH BEAUTY OF UNCUT GEMS



Unusually beautiful glass chips in the colors of amber, amethyst, sapphires, emeralds, peridot, (lemon-lime) topaz and ruby. Many creative decorative uses in the home. Range in size from tiny particles to 1". Supplied in

2 1/4" x 6 1/2" box. Gross weight—approx. 2 1/2 to 3 lbs.
No. 70,531 \$2.25 Ppd.

LUMPS OF OPTICAL GLASS



Irregularly shaped as illustrated. Same shape as it comes out after pot is shattered. Fine pot stirred glass suitable for objectives and camera lenses. Annealed checked for striae, etc., and is within Army and Navy specifications. Also makes a wonderful decoration piece because it looks like a large rough diamond.

LBC-2 Index 1.5725 V 57.4
No. 70,612 Approx. 2 to 3-lb. piece **\$4.00 Ppd.**
No. 70,824 Approx. 7 to 8-lb. piece **8.00 Ppd.**

DF-3 Index 1.6210 V 36.2
No. 70,067 Approx. 2 to 3-lb. piece **\$4.00 Ppd.**
No. 70,825 Approx. 7 to 8-lb. piece **8.00 Ppd.**

Achromatic Objective Lens Blank Sets. Make your own objectives and save. (See lens cement page 78.)

Dia. 2.13", Index Crown 1.511 (63.5); Flint 1.617 (36.6)

No. 7008 \$1.25 Postpaid

Dia. 3.42", Index Crown 1.517 (64.5); Flint 1.617 (36.6)

No. 7031 \$4.00 Postpaid

ATTENTION OPTICAL MANUFACTURERS! WRITE FOR RAW OPTICAL GLASS CATALOG

We have a large stock of war surplus lens pressings and optical glass on which we've drastically reduced the price. You can save money and get immediate delivery. Write for our Bulletin 33 today.

BRAZILIAN QUARTZ CRYSTALS

Rough average size. Much larger than U. S. quartz. Not optically defective, but without correct electrical axes for crystal use. Can be used to make quartz prisms and lenses. You get 8 oz. or more in one or two pieces at our option.
No. 40,135 \$1.00 Postpaid

HEAT ABSORBING GLASS

Used between light bulb and condensers to protect optics and slides from excessive heat.

No.	Size	Thickness	Price, Ppd.
4073*	1 3/8" diam.	3/32"	\$0.75
30,502*	1 3/8" diam.	5/32"	1.00
30,503*	1 7/8" diam.	5/32"	1.25
4010	2 x 2" (Sq.)	1/4"	.30
4063	2 5/16" diam.	5/32"	.50
4071*	2 1/4"	3/32"	1.50
40,632*	3"	1/4"	2.00
4009	4 x 5" (Rect.)	1/4"	.65
40,206	2"	1/8"	.50
40,207	2 3/8"	1/8"	.75

*These are made of specially tempered heat-absorbing glass that will withstand higher temperatures without breaking. The special manufacturing process by which this glass is made results in a number of bubbles. These usually do no harm. Other glass listed should not be used with bulbs over 150 watts unless blower is used.

See Slide Thermometer used for measuring a projector's temperature, page 65.



Collimator or Parallel Light Source

- Original Govt. Cost Approx. \$100.00
- New, Excellent Condition . . . **\$9.95 Ppd.**
- f/2.5 Achromatic Lens
- Excellent for Optical Tooling Applications

THE STORY: This was made for use as a special purpose gunsight (N3C). However, it is essentially a collimator or source of parallel light. Unit is 2 3/4" x 5" x 6 3/4". Contains opaque metal reticle with precision .010" center pinhole and outer ring; 2" diam. by 5 3/8" F.L. achromatic lens (f/2.5); small first surface mirror; reflector glass plate (1/4" x 2 5/8" x 3 3/8") which if you mount over objective lens at 45° angle will project reticle image out into space. Bulb operates on 14V. Use the inexpensive transformer listed below, or convert to 110 V by using Christmas tree bulb. Wt. 2 lbs. Sturdily built, with two sets of convenient mounting lugs. Objective lens is in threaded metal cell . . . adjustable for focus with spanner wrench.

APPLICATIONS in production and research for:

- Collimator and parallel light source.
- Telescope finder for 6" and larger scopes.
- Adjusting telescopic riflesights.
- Determining parallelism of plane surfaces.
- Setting up a form or template.
- Machine shop angular relationships.
- Determining shape or curvature.
- Making directional measurements and adjustments.
- Adjusting or re-aligning binoculars.

Directions included for making bench and vertical collimators, finder telescope; how to use to adjust gunsights, determine curves and template set-ups, align binoculars.

No. 70,774 \$9.95 Postpaid

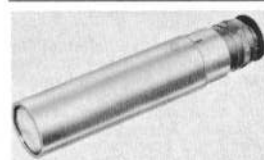
Similar to Above, but with Movable Reticle. Gunsight N3B. Adaptable as telescope finders, etc. Bulb included.

No. 70,806 \$11.95 Postpaid

AUTOTRANSFORMER to operate either light source on 110 volts. Output 21-V, 60-C AC at 7 amp.

No. 60,582 \$2.95 Ppd.

28-V Bulb for above (either). **No. 81 75c Ppd.**



**DELUXE
OPTICAL
ALIGNMENT
TELESCOPE
FOCUSES FROM
20" TO INFINITY**

Versatile and accurate telescope for aligning jigs, fixtures, radar antennae, towers and similar structures requiring precise positioning. Power at infinity, 5.6X; at 20", 8.1X. Wide (12°) field at infinity. Fine 90° crossline glass reticle. Excellent light gathering power.

High quality coated optics include slide-focusing achromatic objective 51 mm. in diam. with 180 mm. F. L. Locking screw provided. Spiral-focusing Erfle eyepiece contains 3 coated achromats, has 32 mm. F. L. and 68° field. Aluminum body with smooth finish measures 2 3/4" O. D. x 10 1/4" (without eyeguard) . . . extends to 14 1/2". Easily mounts on V blocks (not incl.) or use our single base, 2-ring mount No. 70,079 (see page 132). Wt. 2 lbs. 2 oz.

No. 70,674 \$85.00 Ppd.

SURPLUS INSTRUMENTS



PELORUS FOR SMALL BOAT OWNERS

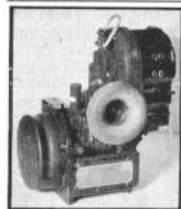
Originally manufactured for use on Navy airplanes. Cleverly adapted for small boats. Locates precise position by sighting on two known points and consulting U.S. Coast and Geodetic Charts.

On 10" post with non-magnetic base and 360° scale. 14½" high.

Built-in, illuminated reticle for night time use. Head easily removed from base for storing, has an optical reflex type sight (easy vertical sighting). Eyepiece is ringed with sponge rubber. Includes polarizing and other filters.

No. 70,084 \$12.95 Ppd.

SEE OUR COLLIMATOR & INFINITE LIGHT SOURCE
PAGE 95 . . . ONLY \$9.95 Ppd. (Govt. Cost Approx. \$100.)



AIRCRAFT BUBBLE SEXTANT

- Natural and Bubble Horizon
- Sun-Sighting Eye Protection
- Error Reduc. Aver. Device
- Type AN-5851-1

With averaging device that reduces any error in the final mean reading. Uneven acceleration of the bubble in a moving aircraft and one or more inaccurate sights in a series made by the observer is compensated for. Has two horizons (natural and bubble). Also: adjustable shading for eye protection when sighting the sun; astigmatism control for accurate alignment of celestial body with bubble, and a natural horizon in-out lever. Operating condition. Includes suspension arm, carrying case and instruction booklet.

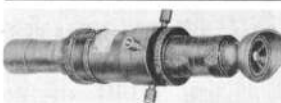
No. 70,574 \$32.50 Postpaid

AVAILABLE AGAIN! USED 8-POWER ELBOW SCOPE

Govt. cost approx. \$300. Gives erect image, right angle viewing with 80° image deviation. Has 1½"-diam. achromatic objective (uncoated), amici prism erector, crossline reticle, 4 filters controlled by click-stop knob. Good for night use . . . exit pupil 6mm diam. Field of view 30 ft. at 100 yds., min. focusing without reticle 19 ft. Length with removable sunshade 12", wt. 4 lbs.



No. 70,044 \$37.50 Ppd.



10X BORESIGHT AND ALIGNMENT TELESCOPE

An excellent, erect-image, war surplus telescope for very accurate alignment of fixtures, assemblies, bearings, shafts, poles, radar antennae, etc. Slightly used. Telescope rotates 360° in threaded (1½" diam. 16-TPI) barrel mount. Four point adjustment permits absolute centering of crosshairs. Focusing ranges from 92" to infinity, with a true field of 3°30'. Eyepiece, with rubber eyeguard, has 11mm eye relief and a 2.2mm exit pupil when focused at infinity. Telescope is 10" long, max. barrel diameter 2", weighs approx. 3 lbs. Supplied in wooden case with instructions. U. S. Gov't. cost approx. \$225.00. Limited stock.

No. 70,884 \$50.00 Ppd.

INFRARED SNIPERSCOPE FIELD COLLIMATOR

Used to adjust sniperscope and objectives and eyepieces. Can be adapted to collimate other instruments. Surplus, but in excellent condition. Unit consists of: COLLIMATOR with gold-reflecting, horizontal-line reticle, 51mm (224mm F.L.) achromatic obj., 6-8 volt bulb, cord, battery clips. FOCUSING MICROSCOPE equipped with 1 achromat and 2 plano-convex lenses. 6X FOCUSING DIOPTRIC TELESCOPE with achromatic objectives, crossline reticle, triplet eyepiece. Carrying case. Measures 2½" x 6" x 32¼" long. Weighs 23 lbs. Instr. included.

No. 85,177 \$125.00 Transp. Charges Collect.

B-3 GYRO-STABILIZED DRIFTMETER

Type used to examine insides of tanks, pipes, jet engines in action and atomic experiments at a safe distance. Laboratories and colleges can use for studying chemical experiments, etc. behind shields. Focuses 4½" to infinity. Adjusting knob permits moving line of sight through 103°, giving 87° to —16° from the axis of the tube. Smooth working, worm gear rotates 2½"-diam. tube a full 360°. Can be used horizontally, vertically or at any angle. Mounting flange 27" from end of scope. Overall length 4 ft. Orthoscopic, 3X eyepiece (½" F. L.) and Kellner, 1X eyepiece (32mm F. L.) included. A treasure chest of PARTS: Optical: two achromatic objectives (48mm diam., 360mm F. L.); 1" cube beam splitter; right angle prism (41mm x 57mm x 40mm); 31° prism; small right angle prisms; filters; reticle; etc.; Mechanical: 5½"-diam., 360° setting circle with worm gear drive (which you can use to build a slow motion, right ascension telescope drive with vernier); rheostat; reticle light; etc. Gyroscope operates on 110 V, 400 C, AC Lamp 28 V. Sump. wt. 30 lbs.

No. 85,156 \$24.50 Transportation Charges Collect



SURPLUS, BINOCULAR EYEPiece ASSEMBLY

Cost U. S. Gov't. approx. \$450.00. Includes two symmetrical type, individually focusing eyepieces with diopter scale; inter-

pupillary adjustment (58-72mm), two sets of red, blue, amber, dark filters, plus clear aperture; two rhomboid prisms and two viewing windows. Unit is mounted in heavy, dust-tight, rectangular brass case. Measures approximately 9½" x 5" x 2½". Overall width including eyeguards approx. 6". Each eyepiece is parallax corrected, contains two cemented achromats, F.L., 27mm, and includes two rubber eyeguards. Weighs 8 lbs. 8 oz. Limited stock.

No. 70,048 \$30.00 Ppd.

WAR SURPLUS, REFLEX GUNSIGHT

Only
\$17.50 Postpaid



Contains a valuable gyroscope with a rotating, first-surface mirror (2½" in diameter) attached to it. Gyro is spring-belt driven by a small, 22-volt, governor controlled, D.C., motor. Also contains two 180mm F.L., 52mm-diameter achromatic lenses, a first surface mirror, flip-down, large, neutral density filter, reticles, etc.

When you illuminate this unit you see the image of two reticles projected out into your line of sight. One is a small crosshair and the other a 6-point adjustable star. Government cost was about \$1,000. Unit is 7" deep x 5½" wide x 7¾" high. Weighs 8 pounds, but we pay postage.

No. 70,711 \$17.50 Postpaid



1 Inch = 25.400mm
1 Millimeter = 0.03937 in.

CONVERSION TABLE

Mm.	Inches	Mm.	Inches	Mm.	Inches	Mm.	Inches
1	0.0394	36	1.4173	71	2.7953	160	6.2992
2	0.0787	37	1.4567	72	2.8346	170	6.6929
3	0.1181	38	1.4961	73	2.8740	180	7.0866
4	0.1575	39	1.5354	74	2.9134	190	7.4803
5	0.1968	40	1.5748	75	2.9528	200	7.8740
6	0.2362	41	1.6142	76	2.9921	210	8.2677
7	0.2756	42	1.6535	77	3.0315	220	8.6614
8	0.3150	43	1.6929	78	3.0709	230	9.0551
9	0.3543	44	1.7323	79	3.1102	240	9.4488
10	0.3937	45	1.7716	80	3.1496	250	9.8425
11	0.4331	46	1.8110	81	3.1890	260	10.2362
12	0.4724	47	1.8504	82	3.2283	270	10.6299
13	0.5118	48	1.8898	83	3.2677	280	11.0236
14	0.5512	49	1.9291	84	3.3071	290	11.4173
15	0.5906	50	1.9685	85	3.3464	300	11.8110
16	0.6299	51	2.0079	86	3.3858	310	12.2047
17	0.6693	52	2.0472	87	3.4252	320	12.5984
18	0.7087	53	2.0866	88	3.4646	330	12.9921
19	0.7480	54	2.1260	89	3.5039	340	13.3858
20	0.7874	55	2.1654	90	3.5433	350	13.7795
21	0.8268	56	2.2047	91	3.5828	360	14.1732
22	0.8661	57	2.2441	92	3.6220	370	14.5669
23	0.9055	58	2.2835	93	3.6614	380	14.9606
24	0.9449	59	2.3228	94	3.7008	390	15.3543
25	0.9842	60	2.3622	95	3.7402	400	15.7480
26	1.0236	61	2.4016	96	3.7795	410	16.142
27	1.0630	62	2.4409	97	3.8189	420	16.5357
28	1.1024	63	2.4803	98	3.8583	430	16.9294
29	1.1417	64	2.5197	99	3.8976	440	17.3231
30	1.1811	65	2.5590	100	3.9370	450	17.7168
31	1.2205	66	2.5984	110	4.3307	460	18.110
32	1.2598	67	2.6378	120	4.7244	470	18.504
33	1.2992	68	2.6772	130	5.1181	480	18.898
34	1.3386	69	2.7165	140	5.5118	490	19.291
35	1.3780	70	2.7559	150	5.9055	500	19.685

SEE HANDY INCH & MILLIMETER RULE PRINTED ALONG EDGE OF PAGE 147.

VISIT OUR FACTORY STORE IN N. J.

Located in Barrington, (Southern) New Jersey, Close to Camden, N. J., and Philadelphia, Pa.

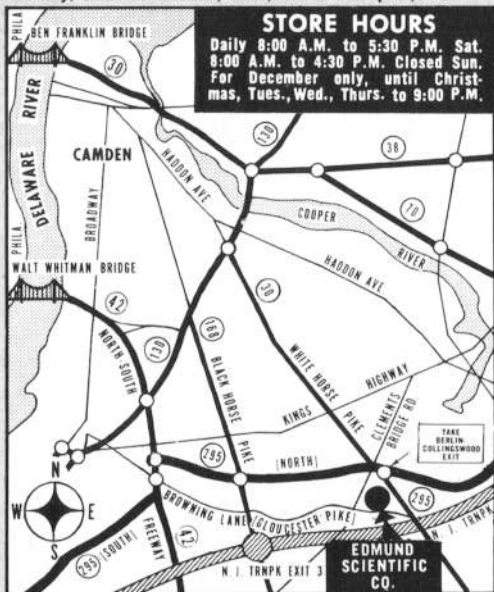
All of the wonderful bargains listed in this General Catalog may be seen in person at our factory store located in our Barrington, New Jersey plant. Customers visiting our store have the advantage of shopping for additional exceptional buys, close outs, one of a kind, and merchandise no longer listed in our catalog because of short supply. You will be amazed at the profusion of items on our special bargain tables.

You and your young people will also find enjoyment in looking through our Japanese submarine periscopes, astronomical and terrestrial telescopes, binoculars, microscopes, spectroscopes. See our selection of war surplus lenses, optical parts, prisms, and war surplus instruments of all kinds.

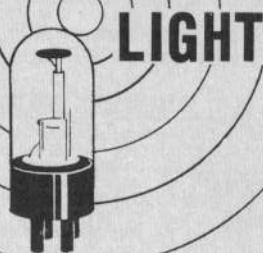
The opportunity to personally inspect our many items will be an experience you will long remember.

People from all over the country stop in to visit us when vacationing in this area, or while attending conventions in Philadelphia, New York, Washington or Atlantic City.

Next Saturday, or on your day off, make a point of driving down to our store . . . you will be glad you did.



- MONOCHROMATIC
- MINIATURE BULBS
- ULTRA VIOLET
- CONCENTRATED ARC LAMP



MINIATURE HIGH-INTENSITY LAMP FOR INDUSTRY OR THE HOME

This functionally designed, American-made lamp offers brilliant, glare-free light and operates on 115-volt AC current. Reflector swivels and has white inner surface. Replacement bulbs, available in auto supply stores, are inexpensive. Excellent lamp for bench inspection of parts and assemblies, soldering, etc. Base has four teflon feet. Arm is fabricated from sturdy steel tubing and extends 15". Three-position switch (Hi-Lo-Off) gives maximum intensity of 150 foot candles 12" from No. 1133 auto bulb. 2 3/8"-diam. reflector turns 160°. Overall 10" long x 2 1/2" wide x 2 1/2" high. With 6' cord. Weight 2 lbs. 1 oz.

No. 70,602 (With 3 bulbs.) \$17.50 Postpaid



ILLUMINATE ART AND SPOTLIGHT SUBJECTS FOR THE CAMERA—GET TRUE COLORS

Unique high-intensity projector light with first-surface, mirror reflector and condensing unit. Six tab levers form light beam into almost any sharp, 4-sided shape. Pivots on platform attachable to ceiling, wall or stand. Metal body 4" x 6" x 3". With #1133 (6-V) bulb.

No. 70,784 \$39.95 Ppd.



MINIATURE SPOTLIGHTS HIGHLIGHT TROPHIES, ART, COLLECTIONS

Illuminate your favorite paintings, trophies, etc. on walls or bookshelves with these 2 1/2' x 1 3/8"-diam. "Dot Spots". 6-watt bulbs, with brass reflectors and quick-mount clips, give low-level accent lighting to almost any area or object. Position them anywhere along their cord. Easily hidden cord has clear covering. 110 volt, U.L. approved. 2 on 10 ft. cord.

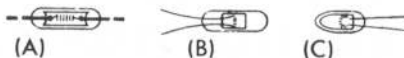
No. 60,602 \$2.98 Ppd.

Additional Spotlights to add to above (no cord).

No. 60,615 \$2.50 Ppd.



FASCINATING . . . WORLD'S SMALLEST LAMPS



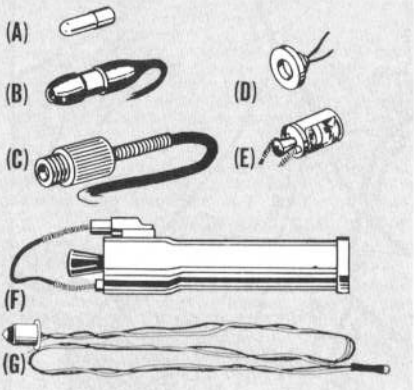
Their unique physical size (.016" to .124" in diam.) and electrical characteristics make them ideal for applications where power and space requirements are set at the absolute minimum. Slightly out of military specifications for aerospace use, but fully suitable for use by the experimenter or hobbyist. All have pigtail leads. May be used for transistor indicators, optical point sources, illuminated jewelry, medical and industrial light probes, modulated light sources, pointer and meter scale illumi-

nators, read out devices, model railroad illumination.

Lamp	(A)	(B)	(C)
Volts	1.5	1.5	5
Current, milliamperes	15	30	55-120
Diameter, Inches	.016	.030	.124
Length, Inches	.065	.080	.250
Light Output, millilumens	60	160	300-1800
Life Expectancy, Hours	1,000	1,000	4,000-16,000
Lead Diam., mils	3	4	7-10
Lead Length, In. (Min.)	3/8	3/8	1/2-1/4
Lead Material	platinum	platinum	copper
Stock No.	40,689	40,690	40,691
Price, Postpaid	\$4.25	\$4.25	\$2.10

GRAIN OF WHEAT BULB AND ACCESSORIES

Useful for low-level, variable illumination of all kinds for instruments, dials, reticles, models.



(A) **GRAIN OF WHEAT BULB**, screw base, 3/8" diam. x 1/2" long, 1 1/2-3 volts **No. 40,188 60¢ Ppd.**

(B) **RUBBER CLAD HOLDER** for No. 40,188 with window, 3/8" diam. x 3" long, waterproof, thread socket. 30" shielded wire lead. **No. 40,629 75¢ Ppd.**

(C) **BRASS THREADED SOCKET** for No. 40,188. 30" shielded wire lead. **No. 40,628 50¢ Ppd.**

(D) **REFLECTOR AND SOCKET** for Grain of Wheat Bulbs. 1/2" deep, 1 3/8" diam., with bright reflecting metal surface. **No. 40,274 50¢ Ppd.**

(E) **SWITCH WITH RHEOSTAT**, use with above bulb. No. 40,188. Has two circuits, one controlled by on-off switch, the other by switch plus rheostat, 1 3/8" diam. x 2 3/8" long, wire leads attached. For any 3-volt battery for operation of lights, motors, etc. **No. 60,345 85¢ Ppd.**

(F) **BATTERY HOLDER** with switch, rheostat, 10" lead, (No. 40,188) bulb and bulb holder. Also see No. 60202 page 53. Holds two flashlight batteries. (not included). Measures 2 1/4" wide x 7 3/8" long. **No. 50,095 \$2.50 Ppd.**

(G) **NEW! FLEXIBLE FLASHLIGHT EXTENSION** sneaks into tiny spaces. 1/8" x 1/4" grain of wheat on 18" cord fits flange-type socket in 2-cell (3-V) flashlights. **No. 40,889 \$1.00 Ppd.**

INEXPENSIVE "BLACK LIGHT" (ULTRAVIOLET) EQUIPMENT for INDUSTRY, MINERALOGY, ART, DISPLAY

Material glowing under black light (ultraviolet) is one of the most beautiful sights in our science-minded world today. It is easy and inexpensive to use and excellent for Science Fair Projects. Commercial uses are expanding rapidly in medicine, criminology, sanitation, mineralogy, geology, advertising displays, industrial inspection, etc. **Types Of Ultraviolet Light Sources:** Some substances, such as certain rocks, fluoresce only under shortwave UV (2537 ang.). Prolonged exposure to short UV can harm the eyes, but simple precautions make use

of our lamps completely safe. Long wave UV (3660 ang.) is the most frequently used. It will make all the paints, etc. listed below fluoresce. One long wave bulb is a special white colored tube which must be used behind a special ultraviolet filter. Our No. 70,364 is slightly more expensive but has a built-in filter. It is not harmful to the eyes. We suggest the following to get started: 1) No. 70,364 or No. 70,256; 2) a supply of fluorescent items; 3) instructions.

No. 9063 25c Ppd.

BLACK LIGHT FLUORESCENT FIXTURE WITH LONG WAVE, BLACKLIGHT BULB . . . 110 VOLTS



110V fluorescent fixture, 10" x 1 1/2" x 1 1/4", complete with six-watt, filter-type black light bulb. Ideal for general work. Operates in the 3200-4000 angstrom range.

No. 70,364 \$9.85 Postpaid

BLACK LIGHT FILTER-TYPE BULBS, Long Wave

Filter eliminates approximately 80% of visible light.

No. 60,124 6 watt, 9" long \$3.25 Ppd.

No. 60,126 15 watt, 18" long \$6.75 Ppd.

Note: The 18" bulb can be used with our portable fluorescent lamps (see page 58) to provide an ideal field light source. Ideal for explorations, checking rocks, etc.

Non-Filter Type Blacklight Bulb. Transmits visible as well as long wave UV light. 6 watt, 9" long. Can use filter 60,127 below. **No. 60,565 \$2.35 Ppd.**

ULTRAVIOLET FILTER GLASS, Long Wave

No. 60,127 2"x8"x1/8" thick \$7.75 Postpaid

No. 70,362 6"x6"x1/8" thick \$15.50 Postpaid

BLACK LIGHT CHALK, CRAYONS, PAPER, PAINTS,



These look ordinary enough, but marks are invisible in daylight, glow in black light. Crayons, chalks, tempera show-card paints, fluorescent papers. Use on display signs, maps, show-cards for striking effects under black light. Many interesting and unusual artistic effects can be achieved

by using all these materials in conjunction with paint-by-number kits. Additional paint colors can be obtained by combining two or more colors. The papers can be used to create artistic effects. For illumination we recommend our Black Light Fluorescent Fixture No. 70,364.

Chalk. Pkg. of 6. Giant pieces, 1" sq., 3" long, in cardboard sleeves. Assorted colors.

No. P-41,063 \$6.00 Ppd.

Crayons. Pkg. of 12. Two each: fire orange, neon red, arc yellow, sature yellow. One each: blaze orange, green, rocket-red, pink.

No. P-41,062 \$1.25 Ppd.

Pencils. Pkg. of 7. Five visible: red, orange, green, blue, yellow; two invisible: yellow and green.

No. P-60,669 \$3.00 Ppd.

Paper. Pkg. of 8 pieces. Each 11" x 14". Blue, cerise, chartreuse, red, chrome-yellow, red-orange, green and orange.

No. P-70,363 \$2.00 Ppd.

LOW-PRICED, LONG & SHORT WAVE UNIT

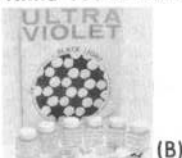


A powerful, compact, versatile lamp. Operates on 115 V. AC or can be operated with two 45 V. "B" batteries with adapter listed below. Excellent portable field unit when used with adapter. Shortwave 2537 angstroms, longwave 3660 ang.

LONG WAVE BLACK LIGHT LAMP KIT PLUS ACCESSORY KIT . . . EVERYTHING YOU'LL NEED



(A)



(B)

Materials for building your own light unit plus instructions and supplies for 40 experiments.

Complete 110-V. Black Light Fixture Kit includes 6-Watt filter-type black light bulb, bulb starter, starter switch, a pair of 2-pronged clips, line cord, 2 wire nuts for splicing wires and complete instructions for assembling. Accessory kit includes a host of materials for beginning experiments with fluorescent rocks, painting with "living" light, writing secret messages, learning invisible detection methods, etc. Included are invisible water paints, invisible ink and dye, tracer powder, fluorescent elastic cord, rock specimens and crayon, brushes, and a packet of experimental papers and plastics. With booklet of 40 experiments

No. 70,256 \$16.50 Postpaid

(A) Complete, 110-V. Black Light Fixture Kit Only. As described above. **No. 70,587 \$7.85 Postpaid**

(B) Accessory Kit only **No. 70,586 \$8.95 Ppd.**

Ultraviolet Booklet. 48 pages (7" x 10") containing 40 interesting experiments. **No. 9360 \$2.00 Ppd.**

TRACE POWDER, INVISIBLE INK, ETC.

Water Color Paints. Pkg. of 8. One each, 2 oz. plastic jars of visible pink, red, fire orange, blaze orange, arc yellow, sature yellow, green, blue. Recommended for indoor use, brush or spray.

No. P-70,941 \$6.00 Ppd.

Lacquer Enamel. Pkg. of 8. One each, 2 oz. plastic jars of visible pink, orange, yellow, pearl white, green, blue; also invisible white and green. Recommend for outdoors. Thin with turpentine. **No. P-70,940 \$8.25 Ppd.**

Trace Powder. Invisible except under black light. Packaged approx. 2 oz. by volume, 1/2 oz. weight.

Green Trace Powder. **No. 40,417 \$1.90 Ppd.**

Orange Trace Powder. **No. 41,068 \$1.90 Ppd.**

Yellow Trace Powder. **No. 41,069 \$1.90 Ppd.**

Water Glow Tablets. Pkg. of 12. One tablet gives fluorescent glow to 15-30 gallons of water. Inside use lasts 2-3 weeks. Outdoors, in sunlight, 1-3 days. Blue (for fountains, waterfalls). **No. P-41,070 \$1.50 Ppd.**

Invisible Ink. Specially formulated for rubber stamp use as pass out mark on hands of students at school activities, patrons at dances, rinks, amusement parks. Eliminates gate crashers. Mark, entirely invisible under ordinary light.

One pint bottle. **No. P-60,665 \$8.00 Ppd.**

Special Stamp Pad for above (uninked).

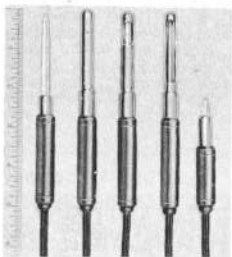
No. 41,084 \$1.00 Ppd.

Well constructed, gray hammertone finish. The only dual wavelength lamp with complete one hand operation. Each lamp has its own switch permitting independent operation. Separate filters provide peak transmission at proper wave lengths with very little visible light transmission. 9-ft. cord. Complete with set of fluorescent minerals and 16-page booklet "An Introduction to Ultra Violet Fluorescence."

No. 70,259 \$29.75 Ppd.

Battery Adapter Case. **No. 70,260 \$7.75 Ppd.**

LIGHT - "BLACK LIGHT"



(1) (A) (B) (C) (2)

Compact QUARTZ PENCIL LAMPS

- For calibrating spectrophotometers, fluorometers
- Light source for interferometers, focalt testers, auto-collimators, etc.
- Source of bright, narrow, lines of ultra-violet and visible light
- For photo chemical effects, medical or biological tests
- For fluorescence analysis and inspection in inaccessible areas

Very small, low-pressure, mercury gaseous discharge lamps in double-bore envelopes. Compact, cool-burning, emit in standard, narrow band mercury line. With appropriate filters, various monochromatic lines are obtained. Shields (A), (B) and (C), with different apertures for directing the light source are available for long lamp (1). Short wave, filter assembly, No. 40,764, can be used for transmitting 2537 a. u. line and absorbing visible light.

(1) Quartz Pencil Lamp With $2\frac{1}{4}$ "-long x 6.5mm-O. D. Tube. Medium intensity, 42 microwatts per cm^2 of 2537 a. u. radiation at distance of 12" (4200 microwatts at 1"). Tube bonded inside $\frac{3}{16}$ "-O. D. aluminum sleeve with special insulating resin. Sleeve sealed in $\frac{1}{2}$ "-O. D. Bakelite handle. Lamp and housing 5" long. Wt. 2 oz. Complete with 15", two-wire, ozone resistant cord set with plug for attaching to power supply (No. 70,298 at right below). Supplied with shield (A), (B) or (C) below.

With shield (A). No. 40,758 \$39.50 Ppd.
With shield (B). No. 40,759 \$39.50 Ppd.
With shield (C). No. 40,760 \$39.50 Ppd.

Accessory Shields Only. For pencil lamp (1) only. Pencil lamp illustrated with shields is not included.

Shield (A). With #60 drill hole for point emission. No. 40,761 \$1.95 Postpaid

Shield (B). With $\frac{5}{16}$ " x $\frac{5}{8}$ " aperture. Used as source for interferometers. No. 40,762 \$1.95 Postpaid

Shield (C). With large $\frac{3}{16}$ " x $\frac{1}{2}$ " aperture. Widely used for calibrating spectrophotometers. No. 40,763 \$1.95 Ppd.

(2) Quartz Pencil Lamp With $\frac{1}{2}$ "-long x 8.5mm-O. D. Tube. Intensity and operation same as above lamp. 3" long overall. Wt. $1\frac{1}{2}$ oz. No shields incl. No. 40,757 \$39.50 Ppd.



Special filter and shield slips over tube, absorbs visible light and transmits 2537 a. u. radiation.

No. 40,764 \$6.95 Postpaid

Monochromatic Accessory Filters. Not illustrated. Ground and polished, 2"-square filters providing 5461 a. u. (green line) or 4358 a. u. (blue line). 2-pc. sets.

Green line set. No. 40,766 \$16.75 Ppd.

Blue line set. No. 40,767 \$16.75 Ppd.



BLACK LIGHT PENCIL LAMP Compact Source of Filtered, Near Ultraviolet Light

Ideal for use in inaccessible locations, in medical observations and fluorescent penetrant inspection of small diameter pipes. Can be used with or without boroscopes for fluorescence inspection in accordance with A. E. C. requirements. Gives sufficient radiation to activate high level fluorescence.

Basically the same as the quartz pencil lamps above, this low pressure, mercury vapor discharge tube is encased in a purple tubular (integral conversion) filter with peak transmission at 3660 a. u. Filter contains conversion phosphors which absorb the 2537 a. u. line and convert this energy to 3660 a. u. Length of tube $5\frac{1}{2}$ ", O. D. .380". Housing same as pencil lamp (1) above. Wt. $2\frac{1}{2}$ oz. Operates with power supply at right. Complete with 15", 2-wire cord and plug as illustrated.

No. 40,765 \$54.50 Ppd.

ULTRAVIOLET LAMP KIT INCLUDES MANY FASCINATING FLUORESCENT SPECIMENS

Detect and identify minerals, messages written in invisible ink, U.S. tagged stamps, etc. with this ultraviolet lamp kit. Approximately 90% of fluorescent materials can be activated with this short wave unit. Add the included "plastic absorber" filter and you can convert it to long wave also. Operates on 110 volt AC. Kit includes lamp, $2\frac{1}{4}$ " diam. x $4\frac{1}{4}$ " long; ballast assembly; cord and plug; filter (for long waves); U.S. postage stamp; single pieces of Willemite, Calcite, Hydrozincite, Halite, Scheelite; trace powder; Fluorescent chalk, crayon and pencils. Attractively boxed. Full instructions.



No. 70,712 \$16.75 Postpaid

NEW LONG WAVE ULTRAVIOLET LAMP . . . HIGH INTENSITY

Portable unit ideal for detecting low level or trace fluorescence, for inspection, laboratory research, medical observation, rock and mineral hunting, etc. Rugged metal housing. Hold, mount or set lamp on carrying handle of transformer base . . . can be rotated 360° and holds any position. 100-watt, flood bulb . . . rated life 3,000 hours. Heat-resistant, 5" round filter. Stable transformer base, $6\frac{1}{2}$ " x $5\frac{1}{4}$ " x $7\frac{1}{4}$ ", has rubber feet, on-off switch, 3-wire cord, plug and adapter. Connects to lamp with 8-ft. cord. For 110-125 volts, 50-60 cycles AC. U.L. approved. Wt. $16\frac{1}{2}$ lbs.

No. 70,713 \$99.75 Ppd.

WORLD'S SMALLEST, LIGHTEST, ULTRAVIOLET LAMP . . . POCKET SIZE, BUILT-IN POWER



- Portable
- Long Wave
- Short Wave
- Transistorized
- Included Ni-Cd Batteries
- Recharger
- Recessed Switch

The best unit we've seen for hand-held operation in the field. No cord or electrical outlets needed. Equipped with wavelength combination lamp which emits both long and short waves simultaneously. By sliding the special "absorber" over the filter, long waves can be emitted separately. Operates 45 to 60 minutes on one charge. Case made of high-impact, blue Cycalac with aluminum battery cover. Measures $1\frac{1}{2}$ " thick x 4" high x $6\frac{1}{4}$ " long. Unit includes battery and 115 volt AC re-charger. Weighs $1\frac{1}{2}$ lbs. with battery.

No. 41,067 \$81.00 Postpaid



POWER SUPPLY . . . Quartz or Black Light Pencil Lamps

For efficient operation of lamps (1) or (2) or Black Light Lamp listed at left. Metal housing with on-off switch and rubber

feet measures $5\frac{1}{2}$ " x $2\frac{1}{4}$ " x $3\frac{1}{2}$ " high. Has 8-ft. primary and 3-ft. secondary cord. 115-volt, 60-cycle AC. Wt. 4 lbs. Starting voltage of lamp approx. 800 V; operates at 220 V, 17.5 ma. Does not include pencil lamp and shield illustrated.

No. 70,298 \$24.95 Ppd.

INFRARED LIGHT AND ITS USES

This 15-page booklet from the Edscorp Popular Optics Library will give you an excellent grounding in the theory and uses of infrared light. Covers the light, spectrum, basic infrared, photographic detection, the sniperscope, power packs, etc. Complete instructions for building your own infrared telescope-microscope. Also included are topics on infrared watchdog systems, fire alarm systems and infrared communications systems. Detailed drawings. Booklet measures 8½" x 11".

No. 9040 75c Postpaid

Infrared Tube and Its Military Applications.

No. 9223 25c Postpaid

SURPLUS, 6-V INFRARED LIGHT SOURCE



Behind the 5½" diam. filter is a gold-plated reflector with a 5-amp., 5.9-V bulb. You will need a 6-V transformer or a 6-V auto battery. Weighs less than 1 lb.

No. 70,613 \$10.00 Ppd.

Lamps for Above. Package of 3 **No. P-40,156 \$1.00 Ppd.**

BUILD YOUR OWN INFRARED SNIPERSCOPE

These 1P25A infrared image tubes convert invisible infrared rays to a visible image. 4¼" long and 1½" in diameter. New—each one tested before shipment. Government cost about \$150.00. Operating voltage 4250 DC. Use with eyepiece No. 60,440 and objective No. 50,165 for low-cost sniperscope.

No. 70,127 \$9.95 Ppd.

NEW FARNSWORTH INFRARED IMAGE TUBE



This is Farnsworth or RCA manufactured tube #6032. It is a later model tube than the 1P25. Potential should be approximately 20,000 volts (as compared to 5,000 for 1P25). Size is

4½" long and 2" diameter at its widest point. Complete directions included. **No. 70,160 \$12.50 Ppd.**

LIGHT — MISCELLANEOUS . . . SPOTLIGHTS, POWER, SUPPLIES, ETC.

2-WATT CONCENTRATED ARC LAMP



High brilliance and very small size. Voltage across lamp 37. D.C. current through lamp 0.055 amps. Candle power 0.32 C.F. Diam. of light source 0.005". Brilliance of light source 15,000 candles per sq. in. Type A-2. Fits miniature 3-pin socket. Burns in any position. Light projects from end of lamp. 2" long, including prongs, diam. ¾".

No. 30,360 \$13.52 Postpaid

ARC LAMP POWER SUPPLY

Matched electrically to the 2-watt arc lamps and used with these to obtain a brilliant point source light. Perfect for demonstrating optical phenomena, testing lenses, illuminating optical instruments, photo enlarging, etc. 115-volts AC, 50-60 cycle. Has power switch, starter switch and switch for momentary increased output. All metal, vented unit with black wrinkle finish measures 6" x 6" x 6". Has rubber feet, 6-ft. input and 6-ft. output cord. Weighs 4 lbs. 4 oz.

No. 70,181 \$39.00 Ppd.



**M-3
\$32500**



We ran out of sniperscopes, but recently were able to obtain just a few of this later model. These Army Model M3 units are in working condition. They have been widely used for crime detection, painting forgery identification, mineralogy and in research labs for many purposes. As a power source we suggest our Nickel-Cadmium Battery (page 13) or a 6-V auto battery.

Telescope is 16¾" long, clear aperture of lens is 50.4mm. A 5" diam. filter is attached. Knob adjusts focus electrostatically. Second knob adjusts reticle intensity. Reticle also has vertical and horizontal adjustments.

Power pack included has 6-V input, 20,000-V output, measures 7½" x 4¾" x 3¾". Includes canvas carrying case and shoulder strap. Power pack provides power for either Farnsworth #6032 or RCA-A6676 image tube. Complete unit includes steel carbine bracket and pistol grip handle with switch control. In 5-compartment carrying case, 11" x 14" x 18". Shpg. wt. 29 lbs.

No. 85,157 \$325.00 Transp. Chgs. Coll.

INFRARED FILTERS FOR PHOTO LIGHT SOURCES, SNIPERSCOPES, SIGNALING & ALARM SYSTEMS

War Surplus. Same filters as used in sniperscope light sources. Manufactured to Government specifications so that in total darkness, so little infrared light passes through it is undetectable from a distance of 20 ft.—even while looking directly at the light source. Each a \$6.00 value. 5½" in diam. x 1/8" thick.

Single Glass Filter with special filtering coating on one surface.

No. 60,033 \$2.00 Ppd.

Sandwich Filter (2 pieces of glass with material between) with rubber surround. **No. 50,166 \$3.00 Ppd.**

INTENSE 10,000 LUMEN SPOTLIGHT OR FLOOD—RATED LIFE 2,000 HOURS

For its size, this quartz iodine lamp is the world's most powerful filament type. Operates right-side up or upside down. Retains 97% of initial brightness throughout long life . . . has self-cleaning iodine cycle. Excellent indoors or out for spotlights, flood lamps or general use. Tapered screw base allows accurate optical alignment. Single-contact mounting (use socket below). Great resistance to thermal shock. Internally fused. Color temp. approx. 3,000° K. For 120-V, AC/DC. Specifications incl. 500-watt; 10,000 lumens. 3½" x 1½".



No. 40,779 \$7.95 Ppd.

250-Watt; 5,000 lumens. 3" x 1½" **No. 40,780 \$5.95 Ppd.**

Screw Socket for either lamp. **No. 40,781 \$1.50 Ppd.**

BARGAIN, 2.7-V FLASHLIGHT LAMPS

Brand new, type PR-9 lamps with miniature flanged bases. Bases need some cleaning due to storage. GE or Westinghouse. **No. P-60,346 Pkg. of 100. \$2.50 Ppd.**

28-VOLT BULBS (MAZDA No. 844)

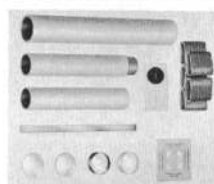
Approximately 1½" round, silvered except 7/8" diffusing spot. 21-candle power. For gunights or concentrated light source. **No. 81 75c each, Ppd.**

LIGHT - SPECTROSCOPES

Spectroscopes . . . Scientific, Educational Tools

The spectroscope is an amazing instrument. It is one of the most important ever devised by man. The spectroscope, in the hands of the scientist has unlocked more secrets of the universe in the short time since its discovery than was ever dreamed possible. In its various forms it is used for basic research, learning and teaching.

COMPLETE SPECTROSCOPE KIT . . . ONLY \$8.50



Here is everything you need to make a fine, working spectroscope, including easy-to-follow directions that make the doing simple. Kit consists of two achromatic objective lenses; a plano-convex lens, a 2 x 2" replica grating slide, film reticle and slit, a $\frac{3}{16}$ " x 7" aluminum bar, 5 rubber bands and tubing-1 piece $1\frac{1}{4}$ " O. D., $7\frac{1}{2}$ " long which is cut in half and 2 pieces 5" with 1" O. D. from which telescope and collimator tubes are made. **No. 50,237 \$8.50 Postpaid**



LOW-COST HAND SPECTROSCOPE

Here is a handy little instrument using diffraction grating replica of 13,400 lines per inch. Excellent for demonstrating spectrum, for neon sign men, to see various spectral lines of gasses, for recognizing transmission and absorption bands of colored glasses, filters and dyes. Also used to identify the more prominent Fraunhofer lines. The replica grating is mounted in aluminum tube $4\frac{1}{2}$ " long and $\frac{1}{2}$ " in diameter with a fixed slit. Low price is possible because of replica grating.

No. 30,280 \$3.50 Postpaid



ADJUSTABLE SLIT

Just the item you need to make your own spectroscope or other instruments. Slit opens to $\frac{1}{8}$ " and closes completely. Made of black anodized aluminum. Will fit into tubes .940" I. D., slides $\frac{3}{16}$ " inside tube.

No. 30,338 \$3.00 Postpaid

MANUAL OF SPECTROSCOPY . . . T. A. Cutting

This important work covers history and theory of spectroscopy, light sources, spectroscopic analysis, uses in mineralogy, characteristic lines of elements, wave length table, etc. Hard bound, 220 pages, 5 $\frac{3}{4}$ " x 8 $\frac{3}{4}$ ".

No. 9283 \$6.50 Postpaid

MAKE SPECTROSCOPES & SPECTROGRAPHS

12 pages 8 $\frac{1}{2}$ " x 11". You'll use lenses, prisms, etc., which can be purchased from us. Easy-to-follow diagrams show spacing of components. Explains the spectrum, prism and grating spectra, Fraunhofer lines, etc. Parts and price list incl.

No. 9052 50c Postpaid



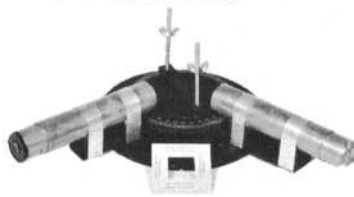
FOR HOME, OFFICE
INDUSTRY

LOW-COST SPOTLIGHT, CONCENTRATED LIGHT

An excellent, portable lamp for use where a concentrated source or spotlight is needed. Special,

internally silvered, semi-frosted bulb, with slide-on aspheric condenser, is mounted on brown metal goose-neck lamp. Six ft. cord and plug incl.

Lamp complete.	No. 70,367	\$9.95 Ppd.
Lamp Only. No bulb or lens.	No. 70,368	4.95 Ppd.
25-Watt Bulb Only.	No. 60,136	1.70 Ppd.
40-Watt Bulb Only.	No. 60,135	2.50 Ppd.
Spot Lens Only.	No. 60,137	4.00 Ppd.



VERSATILE, LOW-COST SPECTROSCOPE

Ideal for experimental or school uses. Can be used with transmission diffraction grating replica (a piece of which is supplied) or with a 60-degree prism such as our No. 30,143, one or two 90-degree prisms such as our No. 3254. It has a rotating prism table with a scale. The telescope arm swings through 120° angle. The 10X eyepiece is standard microscope size with reticle. Slit is adjustable. It has adjustable focusing. Optical system includes two achromatic 25mm diameter, 122mm F.L. lenses. Telescope and collimator arms extend from 5" to 8" for focusing. Diameter of base is 6". Overall height approx. 4" and overall width approx. 14". Instructions included. **No. 70,229 Only \$39.50 Postpaid**



PRECISION ADJUST- ABLE OPTICAL SLIT

Here is a highest-quality optical slit of micrometer precision, available as a stock item instead of only on special order. This precision instrument has a basic use in high-level

spectroscopy or wherever an extremely accurate adjustable slit is required. Both jaws stay completely parallel and open equally from the center, maintaining the same optical axis at all adjustments. The slit is made of brass and stainless steel, and black-coated. Dimensions are: overall length 40.8mm, width 51mm, height 38mm, tube diameter 23.9mm, O. D. and tube length 28mm. Jaws have usable opening, from 0 through 6mm.

No. 40,488 \$89.00 Postpaid

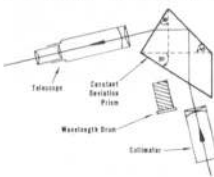


60-DEGREE SPECTROSCOPE PRISM

Polished surfaces flat to $\frac{1}{2}$ wavelength. Angles are accurate to 5 minutes of tolerance. Dimensions of polished surfaces 1" x $1\frac{1}{16}$ ". Made from dense flint glass, free of striae and strain. Index of refraction 1.648. Ideal for use with all models of spectroscopes. The 60-degree angle provides the greatest dispersion of the spectrum consistent with the least loss of light. Functions well in precise laboratory measurements. Use it to make a spectroscope. **No. 30,143 \$8.25 Postpaid**

CONSTANT DEVIATION (PELLIN BROCA) PRISM

Use for precision, easily calibrated spectroscope—wavelengths correlate directly with angle of rotation. No need to change position of slit, collimator or telescope tube... just rotate prism. Up-to-date Bunsen-type spectroscopes. Entrance and exit faces approx. 1".



No. 30,342 \$15.00 Ppd.

See Edmund's Star Spectroscope, Page 140.

LINE SPECTRUM and MONOCHROMATIC LIGHT SOURCES... UNEQUALLED SPECTRAL PURITY

Easy to operate and truly dependable. Emit a number of spectral lines and meet the demand for photo chemical effects, spectroscopy, radiation physics, interferometry and refractometry.



OSRAM SPECTRAL LAMPS .. HIGH ENERGY, CONSTANCY & PURITY

All Lamps Emit Line Spectra • No Readjustment During Operation • Glass Outer Bulb • All 6 1/4" High, 1 1/4" O. D.

Description	Burner	No.	Price Ppd.
Cadmium (Cd)	Quartz	50,054	\$29.20
Cesium (Cs)	Glass	50,055	28.25
Helium (He)	Glass	50,056	29.20
Mercury (Hg)	Quartz	50,057	29.20
Merc. Cadmium (Hg/Cd)	Quartz	50,058	32.30
Potassium (K)	Glass	50,059	29.20
Sodium (Na)	Glass	50,060	29.20
Neon (Ne)	Glass	50,061	29.20
Rubidium (Rb)	Glass	50,062	28.25
Thallium (Tl)	Quartz	50,063	28.25
Zinc (Zn)	Quartz	50,064	29.20
Merc. (Ultra violet Hg/3)	Quartz	50,065*	38.48



*Outer envelope window permits short wave radiation.

FILTERS ... ONLY \$9.75 EACH, PPD.

2" x 2" size. Table at right shows filters to use.

Filter No.	Stock No.	Filter No.	Stock No.	Filter No.	Stock No.
1	19,037	11	19,047	21	19,057
2	19,038	12	19,048	22	19,058
3	19,039	13	19,049	23	19,059
4	19,040	14	19,050	24	19,060
5	19,041	15	19,051	25	19,061
6	19,042	16	19,052	26	19,062
7	19,043	17	19,053	27	19,063
8	19,044	18	19,054	28	19,064
9	19,045	19	19,055		
10	19,046	20	19,056		

ONLY \$9.75 EACH, Ppd.

No.	Designation	Quantity per Litre of H ₂ O	Cell No.
29	Nickel Cobalt Sulphate NiSO ₄ + CoSO ₄	303 g + 86.5 g	C-1
30	Picric Acid	16 mg	C-1
31	Potassium Chromate K ₂ CrO ₄	150 mg	C-1
32	Nitric Acid HNO ₃	n/5	C-1
33	Copper Sulfate CuSO ₄ + 5H ₂ O	57 g	C-2

(No. 33 suppresses infrared and remaining radiation transmitted by other filters. Used when isolating lines from 308 mμ to 589 mμ.)

NOTE: Filters 29-33 are liquid types that can be prepared by you. These preparations can be used in the special cells listed by each filter. See lower right column.

No. 34. Transmits 45% at 254 mμ.

For transmission of the far ultra-violet emitted by the Hg/3 lamp (No. 50,057) and suppression of most visible light. For examination of fluorescence produced by the 254 mμ line. 2" x 2" size. **No. 19,065 \$9.75 Ppd.**

No. 35. Transmits 50% at 365 mμ.

For transmission of the near ultra-violet light emitted by the Hg lamp, and suppression of most visible light. For examination of fluorescence produced by near ultra-violet radiation. 2" x 2" size. **No. 19,066 \$9.75 Ppd.**

POWER SUPPLY ... Operates All Osram Spectral Lamps At Left

Just dial correct lamp power. Complete with lamp holder and shield as illustrated above (no lamp). Wide scale meter ... 5 to 1.5 amps. Shpg. wt. 30 lbs., transportation charges collect. **No. 85,115 \$99.75**

MONOCHROMATIC CONVERSION TABLE

Wave Length of Spectral Lines in mμ ¹	Lamp	Combination of Filters No.	Approx. Transmission at Room Temperature in %
308	Zn	4+29+30	6
313	Hg	4+31	35
326	Cd ²	4+29+31	6
334	Hg	4+29+32	10
328/30/35	Zn	4+29+32	2
352/53	Tl	2+9+29 ⁴	8
365	Hg	2+9	20
378	Tl	2+20	30
404/7	Hg	1+3+18+8	0.8
435/6	Hg	9+15+5	3.7
456/9 ³	Cs	8+20	40
468/80	Cd ²	8+16	27/22
468/72/81	Zn	8+16	27/28/22
509	Cd ²	6+19+7	20
535	Tl	12+17	34
546	Hg	14+21+11+7	8
577/79	Hg	10+22+10	14
588	He	10+23+10	10
589	Na	10+23+10	10
636	Zn	24	86
644	Cd ²	24	89
668	He	25+28	—
707	He	27	65
767/70 ³	K	13+27	25
780/95 ³	Rb	13+27	25
794...921 ³	Cs	13+27	10
852...921 ³	Cs	13+26	1

NOTES: PERTINENT TO ABOVE TABLE

¹ One mμ = 10 Å. ² The sharpness of the lines increases as loads grow weaker (minimum current however is 1 amp). ³ At low current. ⁴ At half concentration.

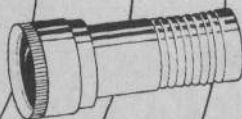
FILTER CELLS

Cell No.	Size	Light Path	Stock No.	Price, Postpaid
C-1	2" x 2"	2 cm	19,067	\$15.00
C-2	2" x 2"	1 cm	19,068	15.00

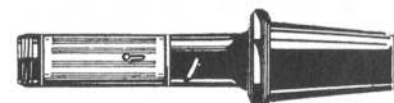
NOTE: Filters and filter cells are not carried in stock, but are handled as special order (allow slightly more time for delivery).

PHOTOGRAPHIC ITEMS

- SPANNER WRENCH
- PROJECTION LENSES
- REMOTE CONTROL UNIT
- FLASHLIGHT POINTER
- PROJECTORS



POPULAR FLASHLIGHT POINTER



Make your slide shows, film strip presentations and lectures twice as interesting and informative with this pointer. Pinpoints interesting details and features on the screen. Flashlight focuses an arrow exactly where you point it. With bulb. Takes "C" batteries (not incl.).

Flashlight Pointer **No. 60,117 \$6.95 Ppd.** Replacement Bulb. **No. 40,383 \$2.00 Ppd.**



5X VIEWERS FOR 8 OR 16MM MOVIE FRAMES

These low-cost plastic viewers can be combined with your excess footage to make truly personal gifts. For example, you can snip off some of the 16mm movies you made of the baby, mount each frame in a viewer-key chain, and have a gift any grandmother, relative or friend will cherish for years. A commercial or industrial photographer can utilize the same idea for premiums or promotions. You can cut and insert a 35mm movie frame or use 16mm frame as is, or mask and use an 8mm frame. Clear viewing area is $\frac{5}{8}$ " x $1\frac{1}{4}$ ". Colored plastic viewer is 1 " x 1 " x $2\frac{1}{2}$ " long, provides 5X magnification.

Package of 12 Viewers. **No. P-60,195 \$2.00 Ppd.**
Pkg. of 100 Viewers. **No. P-70,645 \$14.00 Ppd.**

5X VIEWER FOR 35MM TRANSPARENCIES like above. Measures 1 " x $1\frac{1}{2}$ " x 2 " long. Chain included.

Package of 6. **No. P-60,220 \$2.00 Ppd.**
Pkg. of 50 viewers. **No. P-70,641 \$15.00 Ppd.**

Write for spec. prices on quantities of 1000 & up

NEW! PHOTO- MACROGRAPHY

MADE EASY!

READ COM-

PENSATING EXPOSURE FACTOR RIGHT ON SCREEN

If you take close ups with extension tubes or bellows, this ground glass focusing screen with scale will put the pleasure back into your exciting hobby. No more charts, tables or calculations. No more bad negatives.

Fits all interchangeable-screen Exakta cameras without adaptation (Praktina and many other SLR's with slight edging). Works with any focal length lens; can be used on view, press or industrial camera by taping to ground glass. Styrene approx. 26.3mm x 38.4mm; max. thickness 8.1mm.

No. 30,563 \$13.50 Ppd.

FLEXIBLE CAMERA OR BINOCULAR NECK CHAIN

Safer than leather strap. Chromed brass, full 36 " x $\frac{3}{4}$ " thick, swivel hook with locks. **No. 30,330 \$2.95 Ppd.**

REMOTE CONTROL CAMERA SHUTTER RELEASE



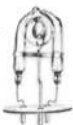
With this unit you can take a picture up to 32 feet away from your camera by just pressing the bulb. Cable fits on plastic drum that has two compartments, one holds 20 feet of cable; the other a reserve of 13 additional feet. This offers the advantage of having two cables and drum for filling up excess. You get just the right amount for any purpose. There is never any excess cord underfoot. Any speed which can be set on the camera including B and T can be activated using this fine release. Fits any camera equipped with standard European type cable release socket.

No. 50,227 \$7.00 Postpaid

FLASHTUBES FOR STROBE UNITS

G. E. FT 118, Xenon Arc. The $1\frac{3}{8}$ " diam. wafer base is designed to be crimped into reflector; 3 pins serve as soldering terminals. For use with units with covered reflectors. Operate on 500 volts. Height from tip to wafer base $2\frac{1}{2}$ ".

No. 40,726 \$9.00 Ppd.



FIRST QUALITY GLASS FRESNEL LENSES



Use these first quality lenses to make your own spot light or for recessed lighting in home or office. See note below table.

Stock No. Diam. F.L. Price, Ppd.

80,018	3"	3"	\$1.00
80,019	4 $\frac{1}{2}$ "	4 $\frac{1}{4}$ "	1.50
80,020	5"	4"	2.25
80,021*	6"	3 $\frac{1}{2}$ "	3.25
80,022*	8"	4 $\frac{1}{2}$ "	4.00

Sizes marked with an asterisk (*) are heat resistant and may be used with large wattage bulbs.

SEE our many PLASTIC FRESNEL LENSES . . . page 93

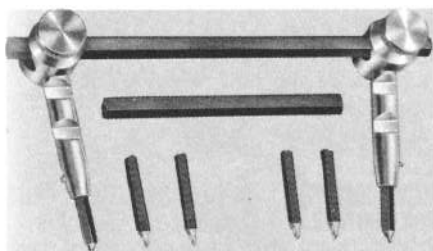


SURPLUS SHUTTER-DIAPHRAGM

Make a low-cost lensless camera for astrophotography (see eyepiece tubing page 131, ground glass 93) or build your own box camera with suitable lens. German shutter assembly

with speeds of $1/25$, $1/50$, $1/100$ and $1/200$ second, plus bulb. Iris diaphragm with stops from $f/3.5$ to $f/22$ opens from 1.75mm to 9mm. Complete assembly is 47.5mm in diameter and has threaded mounting barrel 24.5mm O.D.; with threaded retaining ring. Manual shutter, M flash synchronization and cable release socket. Threaded openings for lenses measure .862" I.D.; lens retaining rings not included.

No. 40,871 \$5.95 Ppd.



NEW EDMUND SPANNER WRENCH REMOVES AND REPLACES RETAINING RINGS QUICKLY, WITHOUT RISK OF DAMAGING COSTLY EQUIPMENT

- Vital tool for cameras, telescopes, optical instruments
- Fully adjustable for $\frac{1}{2}$ " to 7"-diameter retaining rings . . . even greater diameter rings with longer bars
- Three pairs of tips handle practically every job
- Hex-bodied tips slip into hex-hollowed arms and lock securely with set screws . . . WILL NOT ROTATE

Here's a well designed, top grade tool that every instrument and optics repair man or just plain tinkerer should own. There's no good substitute for it. Aluminum bodies with locking knobs hold aluminum arms in vise-like grip against bar. Adjustable legs allow you to extend tips from $\frac{1}{2}$ " to 3" below spanner wrench body.

Wrench includes two hex bars of high-tensile steel, $\frac{3}{4}$ " length and 7" length ($\frac{3}{8}$ " across flats). Three pairs of general purpose tips provided: two .025" thick flat tips. Two .062" thick flat tips, and two .062"-diam. pin-type tips. If desired, you can make a variety of your own special purpose tips out of simple $\frac{3}{32}$ " Allen wrenches.

No. 70,751 \$12.50 Postpaid



STEADY CAMERA OR BINOCULARS WITH "BELT-POD"

If you've ever made systematic test exposures, you know how difficult it is to get crisp, sharp photos at $\frac{1}{30}$ sec. with a hand-held camera.

The "belt-pod" works wonders where bulky tripods are impractical or forbidden, provides a rigid support and permits you to slow down shutter speeds considerably. Excellent too for tripod-threaded monoculars or almost any binocular with "tripod mount." (See No. 50,362, page 17.) Three-section, aluminum post telescopes from 8" (fits most gadget bags) to $17\frac{1}{2}$ " for fast, eye-level shooting. Locks securely. With rubber neck strap for extra steadiness and 6"-wide, black plastic belt support. Snap-type holster included for carrying on your belt, at your side.

No. 70,865 \$5.95 Ppd.



GUNSTOCK MOUNT AIDS SHARP, CRISP PHOTOS

Don't ruin any more pictures by camera motion. Great for all cameras . . . especially cine

and still cameras with telephoto or zoom lenses. Shoulder butt on 14" metal stock ensures perfect balance. Shooting end has finger-molded handgrip with built-in, vinyl-covered 20" cable release. Platform slides on stock, locks securely. Wt. 10 oz. **No. 70,750 \$10.70 Ppd.**

NEW JET BLACK PHOTOGRAPHIC BACKDROP

This superior light absorbing fabric is excellent whenever your shots need a dark background. Good too for lining optical instruments where absorption of stray light is of utmost importance. Smooth, velvet-like rayon pile soaks up light. Properly handled, the pile won't fade or fall. Easy to handle, lightweight and strong. 45" wide. **No. 2503 Per yard. \$2.50 Postpaid**



PERFECT PHOTO AND SUN BATHING REFLECTORS BIG SHEETS OF ALUMINIZED MYLAR

Handle the problem of high contrast pictures just like the pros do . . . with a low-cost, highly efficient reflector that fills in shadow areas and gives pleasing detail in all portions of your pictures. This is aluminized mylar cemented to big, durable sheets of smooth, white card stock. Gives extremely high reflectivity, excellent for photography . . . outdoor, table top, portraits, trick shots.

Can be cut to any size or shape . . . rolls up for easy carrying. Perfect too for constructing a sunbathing reflector—tan faster and more uniformly—for experimenting with heat reflection, for building solar cooker, for holiday decorations, etc. Approximately .015" thick. Sheets may have small faint creases, but this will not affect their reflectivity.

Sheet 48" x 42".

No. 80,087 \$3.00 Ppd.

Sheet 48" x 21".

No. 70,773 \$1.75 Ppd.

Sheet 24" x 21".

No. 70,747 \$1.00 Ppd.



UNIVERSAL TRIPOD CLAMP COMBINATION



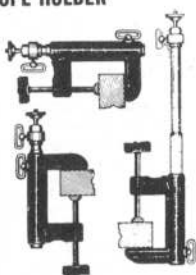
Here is a unit that can be as valuable and useful to a photographer as his camera itself. It is a "must" for any serious photographer. Perfect for indoor and outdoor use in the many situations that an ordinary tripod cannot handle. Use it as a light stand, as a copy stand, or for supporting your camera for time exposures, crowd shots, photo-micrography. It consists of 18 pieces. 5 $\frac{1}{2}$ " sturdy clamp with 2 clamp heads for use on varied surfaces. Three 5" tripod extensions and two 2 $\frac{1}{2}$ " extensions tilt head; adapters for European and American cameras. **No. 50,236 \$15.95 Ppd.**

CLAMP-ON CAMERA-TELESCOPE HOLDER

- Clamps right to auto window

Quickly clamps onto almost any surface to give your camera, telescopes, lights, etc. steady support. Felt-top head allows you to aim in any direction, locks in place. Standard $\frac{1}{4}$ "-20 thread and adapter for European cameras. Adjustable height, max. $13\frac{1}{2}$ ". Measures 6" x $3\frac{1}{2}$ ". Attractive chrome and gray finish. Clamp opens to 2 $\frac{1}{2}$ ".

No. 50,230 \$8.95 Ppd.



PHOTOGRAPHIC - ITEMS

NEW JUMBO TRIPOD HEAD HANDLES HEFTIEST CAMERAS

Ever experience second thoughts when you've used a tilt-top head? Well here's good news. Made in Holland by master craftsmen, this all new tilting-panning, ball-and-socket tripod head runs rings around former "lightweight" models that slip, slide and vibrate. Gives you fast, sure footed camera positioning, insures a greater percentage of extra sharp pictures. Tilt or pan to any angle through an arc of 180°, and a twist of only one large control knob (1 1/4" diam.) locks camera securely. Big 1 1/4"-diam. ball-and-socket joint and precision engineering make this the "best of its kind." Gives firmer, stronger grip; has big, 1 1/2"-diam. camera platform. Reversible stud permits use with either American or European tripods. Handles even heavy press and movie cameras, telescopes or binoculars. Made of durable aluminum, 4 1/2" high x 3" wide overall.

No. 70,849 \$10.50 Ppd.



NEW ZIP-GRIP—FAST, EASY WAY TO MOUNT YOUR CAMERA ON YOUR TRIPOD

Mount your camera in less time than it takes to focus and shoot. Secure it to the tripod by simply flicking a lever. Clamp with powerful, spring-loaded jaws holds camera-attached disc in vise-like grip—even when pointed straight down. And you simply flick lever again to remove camera. Metal disc 1 1/4"-diam. and clamp 3" long both have standard 1/4-20 threads, fit nearly all tripods and cameras.

No. 40,941 \$5.25 Ppd.



SOLID GLASS PHOTO FILTERS... UNMOUNTED

Size Mm	Thk. Mm	No.	Price Ppd.	Size Mm	Thk. Mm	No.	Price Ppd.
Type G.				Type K-2.			
33	1.5	40,360	\$0.85	39	2	40,351	\$0.95
39.5	1.5	40,361	.95	42.5	2	40,352	1.00
20.5	1.7	666	.60	20.5	1.7	667	.50
25	1.7	670	.65	25	1.7	671	.65
Type A.				Type X-2.			
30	1.7	674	\$0.80	33	1.7	682	\$0.85
33	1.7	679	.85	Type X-1.			
				25	1.7	672	\$0.65

Series and
diopeters
etched on
lenses



Cash in at real savings on the tremendous fun of close up photography. Take head-and-shoulders portraits; copy prints, artwork, printed matter, etc.; shoot full-frame pictures of your favorite flowers; even take big, detailed photographs of insects, small parts. Experiment with table top photography and the fascinating lighting problems surrounding it.

These quality, crown glass lenses are precision ground and polished. Though unmounted, they are edged to fit Series V and Series VI "filter holders" perfectly. Series V lenses are 30mm in diam.; series VI 41mm. For cameras taking other sizes, step-up and step-down rings are available in local camera shops or by mail.

Most convenient to use with single lens reflex cameras (you get exactly what you see) but can be used with all cameras by measuring the field and the focusing distance or by using a simple composing frame.

NEW! EDMUND SERIES V AND VI UNMOUNTED CLOSE UP LENSES

1/3 to 1/2 the price of ring-mounted lenses

Can be used singly or in conjunction (for increased magnification), require absolutely no exposure compensation and do not affect operation of automatic diaphragms. Uncoated. Table shows focusing distance applicable for each lens. Available separately or as a complete set of 6 for each series. Instructions included.

Diopter	Focuses to	Series V	Each Ppd.	Series VI	Each Ppd.
Plus 1	38"-20"	94,639	\$1.00	94,645	\$1.10
Plus 2	20"-13"	94,640	1.00	94,646	1.10
Plus 3	13"-10"	94,641	1.00	94,647	1.10
Plus 4	10"-7"	94,642	1.00	94,648	1.10
Plus 6	5 1/2"	94,643	1.00	94,649	1.10
Plus 10	3 1/2"	94,644	1.00	94,650	1.10
Series V (set of 6).		No. P-40,930	\$5.50 Ppd.		
Series VI (set of 6).		No. P-40,931	\$6.00 Ppd.		



NEW! MORE VERSATILE RACK AND PINION UNITS FOR PHOTOGRAPHERS, LAB MEN, HOBBYISTS

Excellent focusing device for photomicrography. Smooth running rack and pinion assembly has 2" x 4" sliding platform for holding any equipment requiring fine linear movement. Platform has through-hole for mounting camera; instructions included for mounting cameras, lights, lens holders, etc. Thumbscrew locks platform in position by forcing nylon friction stop against track; tension plate below platform allows positive lock if required.

Simply turn plastic knob with pinion to drive platform smoothly along either 12" or 24" track with full-length rack. Tracks (sold separately) have holes for mounting complete assembly, or you can drill and tap track for tripod use. Heavy-duty tracks and platform of noncorrosive aluminum.

Slide Platform only (with knob and pinion, thumbscrew lock and tension plate). **No. 40,891 \$11.00 Ppd.**
12"—long Track only. **No. 60,572 \$8.00 Ppd.**
24"—long Track only. **No. 60,573 \$13.00 Ppd.**

See Exposure Factor—Focusing Screen—Page 104.

NEW "VACUUM-POD" MOUNTS CAMERA FAST

You read about it in U.S. Camera—here it is, one of the cleverest solutions yet to the bulky tripod. This 5" x 4 1/4" x 2" vacuum base complete with tilting-panning camera head attaches instantly to almost any smooth, non-porous surface—formica, linoleum, metal, glass, etc. Excellent for use on car window for easy to get nature and scenic shots, or as a rock-steady mount for available light work. Lever actuated rubber base plate creates vacuum that anchors this unique camera mount securely for long periods. When you're finished shooting, simply flip lever to release. Tilt head can be attached to flat top or to end of pod as shown.

No. 70,842 \$6.00 Postpaid



AMERICAN MADE OPAQUE PROJECTOR

Toy Projector Enlarges up to 3" x 3½" Black & White or Color Illustrations

Ideal Gift, Fascinates Youngsters . . . Only \$7.95 Ppd.



Projects and enlarges black and white and color illustrations without using film or negatives. Here is an ideal low-cost gift item. Children particularly like it because it provides hours of amusement and fun. There are always new pictures to project from magazine pictures, comics, color book figures, photographs, etc. Any opaque drawing can be seen projected provided the unit is used in a darkened room. Children find this fascinating fun.

Size of projection depends on distance from screen; however, the less magnification, the brighter the picture will be. Case is made of gleaming black plastic with carrying handle built right in. Operates on 115 volt, AC current. Uses an ordinary 60-watt household bulb (not supplied). 100-watt bulb will improve picture brightness but should not be used for long periods because of heat. Included are 6-foot extension cord and plug. United Laboratories approved. Size 12" long, 8" high, 4½" wide. Weighs 1 pound, 12 ounces.

No. 70,199 Only \$7.95 Postpaid

LOW-COST OPAQUE PROJECTOR

Offered in response to many customer requests, it projects an enlarged image of any opaque copy up to 6" sq., black and white or color . . . drawings, photographs, sketches, or newspaper clippings. Copy over 6" x 6" can be projected in sections. At 6 ft. it projects a 3½-ft. square image. Enables teachers, scout leaders, etc., to brighten up courses and programs. Eliminates costly pantographing and copying for artists. Must be used in darkened room for best results. Should not be compared to \$200.-\$300. models . . . has two simple lenses.

Sheet steel case with black wrinkle finish measures overall 11½" high, 13¼" wide, 9" front to back. Has bakelite handle. Includes slide platform which holds illustrations . . . prevents curling and allows you to change pictures without moving projector or refocusing. 5½-ft. cord. Uses two standard 100 or 200-watt household bulbs (not included).

No. 80,066 Only \$48.00 Postpaid



Now! Dazzle Your Slide Show Guests with Optical Art

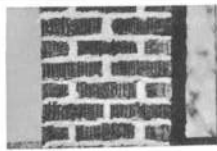
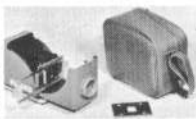
Mobile Reflected Light Image Kit. Light from your 35mm projector dances in radiant colors in step with your favorite recorded music. Place our easy-to-prepare multi-colored slides in your own 35mm projector aimed at our flexible reflector. You move the reflector to fill the screen with sweeping, dancing, graceful flares of brilliant hues. Make multi-colored, multi-forms appear and fade to match tempo of the music. Excellent for all ages as creative, free form art expression at schools and at home; as a unique party activity. Kit includes: 5 reusable glass slide mounts, 44 (1"x4") transparent color sheets, 8 (8"x10") sheets of reflecting foil in 4 colors, 1 (6"x6") section of regular mirror with flexible backing (½" squares), 4 (8"x10") aluminized mylar reflectors, 2 (8½"x11") sheets of non-reflecting flock paper, 1 (4"x5") sheet of reflecting-type diffraction grating and complete instructions.

No. 70,805 \$6.00 Ppd.

EASY-TO-CARRY 35MM PROJECTOR

Completely portable, measures only 5" x 3" x 4¾" when closed, 8½" when open for projecting. Sturdy metal with attractive gray wrinkle, chrome-plated finish. f/3.5 anastigmat projection lens will project your slides without distortion. Quality features: 110 watt, 120 volt, S.C., bayonet base projection bulb for clear, bright picture; slide carrier; precision ground and polished condensing lenses; 6'6" cord. Includes leatherette, zippered carrying case for projector and accessories.

No. 70,232 \$22.95 Postpaid



ALL ABOUT TELEPHOTO LENSES By Sam Brown

Clearly Written, Profusely Illustrated

It's fun taking "big pictures" of distant objects. At the beach, watching a ball game, on hunting trips, in the mountains . . . you will find many occasions where the closeup view of the long distance shot makes fascinating photography.

This popular booklet has 36 pages full of facts of telephoto systems that you can build.

Includes directions for taking long distance photos through binoculars and monoculars. Easy to follow directions on many other types of telephoto systems using lenses and other parts that you can purchase from us.

Also included is information on the best types of filters to use, exposure factors, "F" stops, film data etc.

No. 9036 65c Postpaid



PHOTOGRAPHERS

New 36-page book "Photography With Your Telescope" tells about exciting long distance photos. See page 141 for full details.

HOW TO BUILD OPAQUE PROJECTORS ... Only 35¢

Project magazine pages, photos, drawings, charts, etc., in black and white or color. Complete detailed designs for 8 different projectors.

This latest revision of our Opaque Projector Book is easy to read and understand. It contains eighteen pages covering the theory of projector optics. There are detailed construction plans for eighteen different instruments in this excellent book. Covers optical layouts, how to design your own doublets, lighting system, even has wide-angle Metrogon lens designs. Extensive object-image table eliminates the necessity of calculating lens results.

Whether you want an opaque projector for visual use only (projecting pictures) or whether you want a drawing projector with fine definition and freedom from distortion, this fact-filled book gives you many to choose from. 18 pages, 8½" x 11". **No. 9314 35c Ppd.**



BUILD AN OPAQUE PROJECTOR FOR 8½"x11" COPY, FOR 5 MAGNIFICATIONS AT ONLY 3 FEET.

f/3.5 COATED METROGON LENS ... 6" F.L.

This unusual lens system will give you large pictures at very short "lens to screen" distances, with no distortion. We mounted the lens system from a government aerial camera into a barrel 2.4" long, outer diameter 2½". This makes it easy for you to build a large-copy, wide-angle opaque projector, which if bought at retail prices would cost up to \$500.00. Excellent for photographic work because you can get 100" picture or larger.

No. 60,305 \$49.50 Postpaid

OPAQUE PROJECTION LENS SETS—UNMOUNTED

Large Anastigmats for 10" x 10" Copy. 14" F.L., f/3.5. Mount them yourself for tremendous savings. These lenses are seconds because of slight edge chips, but we guarantee that this will not interfere with the fine definition and flat field of these anastigmats. Spacing directions and mounting hints are included.

Magnification (10" x 10" copy): 3X 6X 10X 15X
With lens to screen distance: 56" 98" 154" 224"
Three unmounted elements, 4" in diameter.

No. 70,783 \$25.00 Ppd.

Plano-Convex Lenses (sets of two). Projector plans are included in our booklet "How to Build Opaque Projectors" No. 9314 (order separately above.)

Diam of F. L. of Lenses	System	Speed	Covers Copy	Stock No.	Price, Ppd.
38mm	6¼"	f/7.2	3¼"	4036	1.00
44mm	8½"	f/8	4"x4"	4040	1.00
86mm	13"	f/7	6½"x6½"	30,179	4.00
89mm	8½"x13½"	f/5	6"x6"	60,238	7.25
47mm	8½"	f/7.8	4½"	40,683	1.30

FINE QUALITY LENSES FOR 35MM PROJECTORS AND VIEWERS



FOR LONG-THROW 35MM PROJECTORS

(A) 125mm, F.L., f/3.5 Coated Anastigmat (Illustrated). T.D.C. Vivid. Threaded barrel is 1½" in diam. x 1½" long.

No. 60,402 \$7.50 Ppd.

125mm F.L., f/3.5 Achromatic Lens System (4 elements) in chrome-plated brass barrel 2¾" long x 1½" O.D.

No. 40,693 \$7.50 Ppd.

Unmounted Cooke Triplet Lens Set. 125mm, f/3.5. Three 1½"-diam. elements and 2 spacers. Lenses have slight defects, but are perfectly usable. Mounting directions included.

No. 40,405 \$2.95 Postpaid

(See projection data below.)

FOR SHORT-THROW PROJECTORS & VIEWERS

(B) Mounted Cooke Triplets (Illustrated). Exceptionally flat field and fine image quality. Tops in medium price range; single elements are not readily affected by heat. Cells are of black anodized aluminum.

For 35mm. 50mm F.L., f/3.5. Cell is ¾" in diam., 25/32" long. Coated.

No. 40,523 \$5.95 Ppd.

For Half Frame 35mm Slides. 35mm F.L., f/3.5. Cell is ¾" in diam., 1½" long.

No. 40,524 \$4.95 Ppd.

For 2¼ x 2¼. 75mm F.L., f/4.5. Cell is ¾" in diam. x ¾" long.

No. 40,522 \$6.95 Ppd.

Unmounted Anastigmat Lens Set. For 35mm. 51mm F.L., f/3.5. Excellent for large screen images within a short projection distance. Three unmounted elements and spacing diagram.

No. 4049 \$3.00 Ppd.

Raptor (Wollensack) Wide-Angle Lens. From Xerox machine. 104mm F.L., f/12.5. Four-element, symmetrical system mounted in brass cell with threaded 1¼" O.D. Coated.

No. 40,815 \$2.50 Ppd.

PROJECTION DATA—IMAGE SIZE AT VARIOUS PROJECTOR-TO-SCREEN DISTANCES

Lenses 4049 & 40,523—at 5' (2' x 3'); 10' (4'2" x 6'3"); 20' (8'4" x 12'6"). Lens 40,522—at 10' (2'10" x 4'3"); 20' (5'8" x 8'6"); 30' (8'6" x 13'). Lenses 60,402; 40,693 & 40,405—at 15' (2'6" x 3'9"); 25' (4'2" x 6'3"); 35' (5'10" x 8'9"). Lens 40,524—at 5' (42" square); 10' (85" square); 15' (11'4" square).

\$3.30 GADGET MAKES A "PSEUDO-FISH EYE" LENS FOR YOUR REFLEX

It's not expensive, but it's lots of fun. Use this 175° optical Observer-O-Scope (used indoors to observe callers without being seen) to make an extreme wide angle lens for your 35mm camera. A unique idea by Norman Rothschild of "Popular Photography". Mount this 2¼" long x ¾" diameter scope

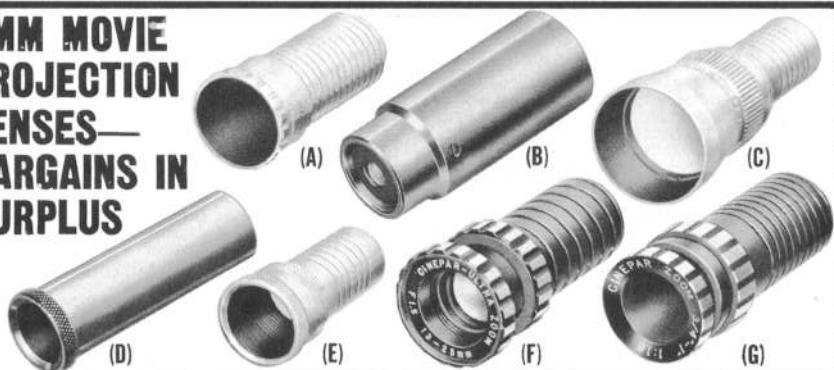
on normal 50mm lens to get 175° image. Simply drill hole in series-size metal lens cap for attachment.

No. 40,582 \$3.30 Ppd.

NOTE: Order one for front door ... check your visitors before you open door. See other protective devices, page 51.



8MM MOVIE PROJECTION LENSES— BARGAINS IN SURPLUS



(A) WIDE ANGLE, 19MM F.L., f/1.6

Brand new and available at a fraction of original manufacturing cost. Gives you 33 1/3% wider screen pictures than you get with the standard 1" F.L. lens. Brings your 8mm movie projector right up to date. Optical system is a coated, 4-element design. Gold-finished, aluminum barrel with spiral focusing threads has standard 7/8" O.D. ... fits most 8mm projectors. Length approximately 2 1/8". (See projection table at lower right.)

No. 40,727 \$3.50 Ppd.

(B) WIDE ANGLE, 7MM F.L., f/2.7

Fine 6-element lens will fill a 30" x 40" screen with a sharp, clear picture at a distance of only 3 1/2 ft. Lens system can be centered in barrel by 3 adjusting screws. Barrel is made of aluminum, 2" long, 7/8" O.D. Fits projectors with 7/8" O.D. lens barrels, but you can adapt to larger diameters by using sleeves. (See projection table.)

No. 40,777 \$4.00 Postpaid

As above, but with two metal adapters to fit any barrel of 7/8", 1", or 1 1/8" diameter.

No. 40,589 \$6.25 Ppd.

(C) DUAL, WIDE ANGLE AND NORMAL SYSTEM, 17MM AND 25.4MM F.L., f/1.6

Brand new, Revere Co. lens gives extra sharp pictures. You get 25% larger than normal picture when using complete unit. Just unscrew wide angle unit for normal size pictures. Fits any 8mm movie projector taking 3/4" O.D. lens barrels. Length 3 3/4". Front diam. 1 3/4". Spiral grooved barrel 1 3/4" long. (See projection table.)

No. 60,194 \$4.50 Postpaid

(D) LOW-COST, 25.4MM, f/2.5

Use for projecting 8mm film, or lighting photo subjects, etc. Chrome-plated barrel with knurled cap is 2 3/4" long, 1 1/4" in diam. (See projection table.)

No. 40,266 \$1.50 Postpaid

Write for special prices available on large quantities.

(E) 25.4MM F.L., f/1.6

Two low-reflection coated achromatic lenses, one 11mm diam., one 17mm diam. in 3/4"-diam. barrel. Lenses are slight seconds because of chips, scratches, etc., but will give good image quality. (See projection table.)

No. 60,196 \$3.95 Postpaid

(F), (G) ADD NEW VERSATILITY, NEW IMPACT TO YOUR 8MM MOVIES — QUALITY Z-O-O-M LENSES

Bring your 8mm movies up to date. Use your projector in virtually any room and fill the screen without moving the projector or its table—simply move these zoom lenses in or out to fill screen with big, sharp pictures. Get 33 1/3% to 100% larger pictures from one position.

These high quality surplus lenses have coated optics. Black and silver finished, threaded aluminum barrels. Both have standard 7/8"-diam. barrels. (F) is 1 1/2" long, (G) 1 1/4" long.

(F) 13 to 25mm F.L., f/1.5.

No. 40,873 \$8.50 Ppd.

(G) 19 to 25mm F.L., f/1.6.

No. 40,874 \$6.95 Ppd.

PROJECTION TABLE

Showing length of image diagonal with projector
10, 16, 25 ft. from screen.

Item No.	Diagonal at:	10 ft.	16 ft.	25 ft.
(A) 40,727		2'6"	4'	6'3"
(B) 40,777		6'8"	10'8"	21'
(C) 60,194 (25.4mm F.L.)		1'10"	3'	4'8"
(C) 60,194 (17mm F.L.)		2'9"	4'9"	7'2"
(D) 40,266		1'10"	3'	4'8"
(E) 60,196		1'10"	3'	4'8"
(F) 40,873 (25mm F.L.)		1'10"	3'	4'8"
(F) 40,873 (13mm F.L.)		3'8"	6'	9'4"
(G) 40,874 (25mm F.L.)		1'10"	3'	4'8"
(G) 40,874 (19mm F.L.)		2'6"	4'	6'3"

OUTSTANDING 16MM MOVIE PROJECTION LENS



CINEPAR, 25.4MM F.L., f/2.5.

Used on projectors, enlargers or magnifiers. Mount it on your camera or incorporate it into a homebuilt one. Coated optics. Built-in iris diaphragm, has stops from f/2.5 to f/22. Heavy chrome-plated barrel complete with screw-in lens shade that also holds filters. Rubber lens cap included. Threaded mount (32 tpi) has 1" outside diam., 1 3/8" long. Projects 1'8" x 2'3" picture at 6'; 2'10" x 3'9" at 10'; 5'7" x 7'6" at 20'.

No. 40,724 \$4.50 Postpaid

Iris Diaphragm only.

No. 40,723 \$3.75 Ppd.

LOW-COST, TILT-TOP, TRIPED HEAD



This sturdily built, chrome plated, brass tripod head has a generous size ball and socket joint with large thumb lock. It tilts and pans to any angle through a 180° arc. Rotates a full 360°.

Has standard 1/4"-20 thread, camera connector and 1 1/8" diam. rubber-covered, camera platform that provides a stable, non-slip surface for average size cameras. Base, with 1/4"-20 thread socket, has 7/8" diam. Overall measures 2" wide x 2 1/2" high.

No. 41,085 \$1.75 Ppd.

PHOTOGRAPHIC - ENLARGING

PRINTING PHOTOS IS REAL FUN . . . START BY "BUILDING A CONDENSER ENLARGER"



This fascinating 16-page booklet, from the Edscope Popular Optics Library, is filled with factual, easy-to-follow directions for building a fine enlarger to handle negatives of any size. Parts list and prices included.

No. 9038 40c Postpaid

F/4.5 ANASTIGMAT ENLARGING LENS

When you make your own enlargements, you will not only have a great deal of fun, but save money as well. It's easy! Select your lens from the several popular sizes of high quality anastigmats listed below. Coated for increased contrast. Color corrected, flat field, excellent overall definition. Click stops on iris diaphragm. Includes retaining ring for mounting.



Stock No.	Focal Length	Coverage	Price, Ppd.
30,181	50mm	35mm	\$10.50
30,182	90mm	2 1/4 x 2 1/4	15.00
50,289	105mm	2 1/4 x 3 1/4	17.50
30,183	135mm	3 1/4 x 4 1/4	23.00
30,184	180mm	4 x 5	53.00

Black Light Coating is a new liquid product. When applied to pictures it causes them to fluoresce under ultraviolet light. See description, page 7.



F/4.5 105MM ANASTIGMAT ENLARGING LENS

You can make your own high quality 2 1/4" x 3 1/4" and smaller size enlarger with this fine lens. It will give you really sharp prints. It has coated optics, click stops, f/4.5 to f/22. If you have a removable lens on your 35mm camera you can make a bellows extension for it and use this for a 2X telephoto lens. Leica threads. Mounting flange is included so that it can be easily built in.

No. 50,289 \$17.50 Postpaid

BUILD AN EXCELLENT MINIATURE ENLARGER

Excellent project . . . half frame 35 and smaller negatives. High quality anastigmat objective has 35mm F.L.; f/3.5, 4, 5.6, 8, 11 and 16 iris diaphragm; brass cell with mounting holes. Fast 3-element condensing lens provides lots of light. Extremely short focal length (26.8mm) and large aperture (front element 43.5mm in diam.) for a really compact instrument. Calculated aperture for collimated light is f/0.62! Effective aperture for 1:1 condenser ratio is f/1.2. In cast aluminum cell with drilled flange. Instructions included.



No. 60,436 \$10.95 Ppd.

Condensing Lens only. **No. 60,432 \$6.00 Ppd.**

PHOTOGRAPH UNSUSPECTING SUBJECTS



For real candid and unusual shots, use this mounted prism with your camera. Shoot at 90°. Prism size: (see page 91) a-41mm, b-57mm, c-40mm. Camera adapter not included.

No. 40,551 \$6.00 Ppd.

ASTROPHOTOGRAPHY—nearly everyone is trying this exciting new field. See Edmund's exclusive **No. 40,975 Camera-Telescope Adapter for 35mm. Single lens reflex cameras on page 141.**

ENLARGER AND CAMERA BELLOWS

Enlargers: 35mm, 1/2 V. P., or smaller. **Cameras:** V. P. Model A. Adapts for V. P. Model B and Series III. Inside of back frame 2 1/2" x 1 5/8". Front hole 1 3/16" diam., extends 3/4".

No. 50,283 \$2.00 Ppd.

Enlargers: 2 1/4" x 3 1/4" or smaller. **Cameras:** 1 Kodak Junior, Kodak shutter. Back I. D. 2 1/4" x 3 1/4". Front I. D. 1", extends 5/8".

No. 50,285 \$2.50 Ppd.

Enlargers: 3 1/4" x 4 1/4" or smaller. **Cameras:** No. 3 Kodak Series III, Kodak and Diomatic shutter. This will fit all 118 Kodak and Ansco cameras by changing front frame. Inside of back frame 3 1/4" x 4 1/4". Front hole diam. 1 1/2", extends 5/2".

No. 50,286 \$3.00 Ppd.

Enlargers: 2 1/4" x 3 1/4" or smaller. **Cameras:** 2C Folding Automatic Brownie, 2C Kodak Jr., Kodak shutter. Inside of back frame 4 7/8" x 2 7/8". Front hole diam. 1 5/16", extends 7".

No. 50,287 \$3.00 Ppd.



2" DOUBLE ENDED CLIPS

Tops for film, photo prints, notes, etc. Durable plastic, assorted colors.

Pkg. of 10.

No. P-60,138 \$1.00 Ppd.

Pkg. of 100.

No. P-70,402 \$8.95 Postpaid

DESCRIPTIVE BOOKLETS

Homemade Stereoscopic Viewers. How to make two different models for viewing transparencies or prints. 4 pgs.

No. 9034 30c Postpaid

Experimenting With Photoelectric Cells. How to build one, plus dozens of applications (industrial and home). 7 pgs.

No. 9041 50c Postpaid

Photomicrography With Pen Microscopes. How to adapt the Edmund pen microscope to any camera for 50X magnifications of blood cells, insects, minerals, etc. Single sheet.

No. 9029 10c Postpaid

The Dummy Camera. How to build one for focusing and pre-composing pictures for a real camera. 4 pages.

No. 9035 20c Postpaid

Like Close-Up Photography? Our booklet "Ultra Close-Up Photography" tells how to take pictures using low cost supplementary lenses that can be purchased from us.

No. 9042 Only 60c Postpaid



F/4.5, 50 MM. F.L. MOUNTED ANASTIGMAT LENS

Famous American Manufacturer's surplus anastigmat camera lens (uncoated) complete in mount with shutter, iris diaphragm and cable release socket. Use for 35mm

cameras, projectors, enlarger, copy cameras etc. Shutter speeds T.B. 1/25, 1/50, 1/100, 1/150; stops down to f/18. Outside diameter 1 5/8". Requires 24mm. retaining ring (not included).

No. 40,985 \$6.95 Postpaid

OTHER EDMUND ITEMS FOR ENLARGING

Low-Cost Iris Diaphragms, page 94

Flood-Light Holder, page 113

Large Color Filter Sheets, page 144

Polarizing and Variable Density Filters, page 2

Large Mylar Reflector Sheets, page 105

Space Age Blankets (can also be used as light-reflectors), page 5

Condensing Lenses, page 85

Moiré Pattern Film Negatives, page 23

Low-Cost Distilled Water, page 6

BUILD YOUR OWN PROJECTORS AND ENLARGERS

Thousands of amateurs have built their own projectors and enlargers using our material. You too can have the fun of doing this and save money by making your own. Start today. Here, and on the pages that follow, you will find most of the optical and mechanical parts you need: lenses, cooling motors, fans, bellows, louvers, rack and pinion mechanisms, etc. Also, complete, easy-to-follow instruction booklets.



HOW TO BUILD PROJECTORS . . . Edmund & Brown

This excellent 15-page booklet gives actual building plans for slide and opaque projectors from the simple "apple box" varieties to more advanced models. Complete coverage of subject matter, including theory of projection and image erection. Plans even include a microfilm reader and a film editing outfit. Lens systems described in the book are available from us. **No. 9014 30c Ppd.**

BUILD THIS JUMBO IMAGE 35MM PROJECTOR

In this kit you get all the optical and some other parts for only \$11.50. You must supply plywood or sheet aluminum to house the parts. The kit includes (1) a mounted, fast f/1.9 projection lens (4-element, F.L. 91.5mm), (2) focusing mount, (3) 100-watt projection bulb and socket, (4) rubber feet & leveling screws, (5) condensing lenses, (6) slide carrier, (7) heat absorbing glass, (8) reflector and switch, (9) and complete directions.



No. 70,320 \$11.50 Postpaid

COOLING MOTOR WITH 4" FAN BLADE



Prolongs life of projector bulbs and allows you to use brighter light. Runs quietly on ordinary 110V house current. Can be used horizontally or vertically $3\frac{1}{4}" \times 2\frac{1}{4}"$

No. 101 \$3.95 Ppd.

3"-Diam. Aluminum Fan. For clockwise rotation. Ten .025" gauge blades, brass bushing and set screw to attach to $\frac{1}{4}"$ -diam. shafts.

No. 40,373 50c Postpaid

$3\frac{3}{8}"$ Diam. Steel Fan. Four blades rotate in counter clockwise direction. Brass bushing and set screw for attaching to $\frac{5}{16}"$ -diameter shafts. Metal is $\frac{1}{32}"$ thick.

No. 40,374 50c Postpaid

SLIDE CARRIER FOR 35MM PROJECTORS

Sturdy steel carrier, $8\frac{1}{2}" \times 2\frac{1}{8}"$, holds cardboard or metal slides.

No. 4065 \$2.00 Ppd.

MIDGET LOUVERS TO RELEASE HEAT (3" O.D.)

Effectively answer the vital need for ventilation. Black anodized aluminum.

No. 60,209 \$1.00 Ppd.

Metal Concave Reflector. $1\frac{1}{8}"$ diam., position $1\frac{1}{4}"$ from lamp filament.

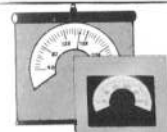
No. 566 75c Postpaid

Bulb Socket. Double-Contact Bayonet Type. For No. 726 and 727 bulbs.

No. 74 35c Postpaid

Bulb Socket. Medium Pre-Focus Type. For use with No. 40,947 and 730 bulbs.

No. 82 \$1.50 Postpaid



MEASURE PROJECTOR TEMPERATURES—STOP SLIDE DAMAGE

Read projector temperatures directly from screen image and note elapsed time until 170°F danger point is reached. You'll then know how long favorite slides can safely be exposed in your projector. Metal mounted thermometer slide, calibrated from 40° to 240°F, fits 35mm. projectors handling plastic slide mounts. It's so quick and easy to use. Has similar application for temperature measurements of opaque, overhead, microprojectors, also microscope illuminators across stage aperture. Measures 50mm. sq. x $3\frac{1}{2}" \times 10$ mm thick.

No. 40,988 \$9.75 Ppd.

TRU-FOCUS PROJECTION LAMP

This DFA type projection lamp has a built-in reflector to give you brighter, sharper pictures. 150-watt, 115-volt.

New special socket comes with the lamp so you can mount it with 2 screws. Size of bulb, $3\frac{3}{16}"$ long x $1\frac{1}{2}"$ in diam.

For best results burn base down. Life expectancy about 15 hours. Always permit air to circulate around bulb or use cooling motor and fan, our stock No. 101. Socket included.

No. 50,189 \$5.75 Ppd.



SMALL-FILAMENT, PROJECTION LAMPS

A high intensity source for projectors, enlargers, viewers. 100 W., T-8108 DC. Bayonet **No. 726 \$1.95 Postpaid**
150 W., T-879 DC. Bayonet **No. 727 2.50 Postpaid**
300 W., T-10P Med. Prefocus **No. 40,947 2.50 Postpaid**
500 W., T-10P Med. Prefocus **No. 730 3.00 Postpaid**

NEW TRANSLUCENT PROJECTION SCREENING

This new material for either front or rear projection is made from an extremely durable and dimensionally stable film, .004" thick. Superb matte surface on both sides provides sharp clear images for wide angle viewing. Mount it on blind roller or frame for finished screen. Superior drafting film too.

Screen size $40" \times 40"$.

No. 80,079 \$5.50 Ppd.

Screen size $12" \times 24"$.

No. 70,662 \$1.00 Ppd.

EASTMAN KODAK REAR PROJECTION SCREEN

Replace ground glass with this black screening. Provides extreme contrast, sharp clear pictures, better diffusion. (20" x 24")

No. 85,002 \$30.00 Trans. Chgs. Coll.

Size $10" \times 12"$

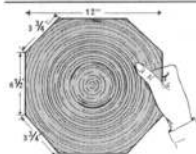
No. 70,047 \$10.00 Postpaid

Size $5" \times 6"$

No. 40,137 \$2.85 Postpaid

Size $4" \times 4"$

No. 40,138 \$1.75 Postpaid



SUPERIOR, TRANSLUCENT PLASTIC, DIFFUSION SCREEN FOR FRONT OR REAR PROJECTION

These plastic, Fresnel diffusion screens are the best we've seen to date. Far better than ground glass and other plastic types. Each screen is rigid, needs no support and gives brighter images and better overall illumination over entire screen area including corners and edges. Cut it to any size you need. Same screen as supplied in our Camera Obscura Kit (No. 70,881). Excellent for rear projection screens, light tracing boxes and in place of ground glass in view cameras. F.L. 311mm. approx. 50 lines per inch. Measures approx. $12" \times 12" \times 1/10"$ thick.

No. 70,883 \$7.00 Postpaid

MAKE A 35MM PORTABLE TABLE VIEWER

Here's the perfect lens for the job complete with instructions and a list of the other optics needed. All the optics can be purchased from this catalog for under \$20.00. Coated 35mm, f/3.5 lens has 2" F.L. In cell $3\frac{1}{4}"$ diam. x $25/32"$ long. Gives sharp image, wide flat field for color or black and white slides. Lens and instructions.

No. 40,523 \$5.95 Postpaid

Mounted Anastigmat Lens. f/3 with 3" F.L., coated. In $1\frac{1}{4}"$ O.D., spiral-threaded barrel, $11/16"$ long.

No. 30,234 \$7.50 Postpaid

PHOTOGRAPHY - AERO CAMERA

ABOUT AERIAL CAMERA LENSES

They make excellent telephoto systems for sports events, big game, birds, etc. Some of the first pictures of the Sputniks were made with war surplus aerial camera lenses. They are used for many kinds of astro photography and are satisfactory for general portrait and landscape photography, both color and black and white. While not designed for copy work, our customers report that they have obtained excellent results using the 24" aerial camera lens for making photostats, photo copies, etc., but the optical system is rather long. They can also be used with an eyepiece for low power, wide field (Richest-Field telescopes). You can build opaque projectors, overhead projectors, etc. with them.



f/2.5 Camera

**THIS FINE AERIAL CAMERA
WITH 12" F.L. LENSES COST
GOVERNMENT \$2,500.00 . . .
YOURS FOR ONLY \$275.00**

This Model K-37 surplus camera was used to photograph targets on night bombing missions. You can use it for any kind of telephoto work. The large f/2.5 lens alone is worth much more than our price for the complete camera and accessories. Remove the lens unit and remount it as a 6X (300mm) telephoto system for use with a 35mm camera, or a 4X telephoto for 2 1/4" x 2 1/4".

Contains a continuous-duty D.C. motor, tubes, capacitor, transformer, photocell and other electronic parts. System operates on 24-V. D.C. power source or can be manually operated. Fast f/2.5, fluoride coated, 4-element lens has 12" F. L. Between lens shutter has speeds of 1/5, 1/25, 1/50, 1/100 second. Electronic shutter trip and cable. 5-roll film magazine and film counter. Lens caps. Two-direction level. Overall size 19" x 16". Wiring schematic and case included. Camera weighs 48 lbs. Shipping weight for entire unit 155 lbs. F.O.B. West Coast.

No. 85,158 \$275.00



Coated 14 element optical system includes big 60-mm objective that ensures crisp, bright to brilliant image. Individual focus and zoom control knobs recessed in top of barrel give infinitely variable magnification from 15X to 60X. Eye relief 15mm. (See specification table at right.) Slideout sunshade built in; screw-on caps for both objective and eyelens. Includes rigid, table-top tripod with azimuth, height and both coarse and fine elevation adjustments. Locks at any angle, quickly disassembles for carrying. Scope 17 1/2" long, black and tan finish, complete with 13 1/2" high tripod. Lifetime guarantee against material defects.

No. 70,858 \$162.50 Ppd.
Telephoto Adapter. Screws onto eyepiece of scope; other end connects appropriate "T"-compatible camera listed opposite. Series V filter holder built in.

No. 40,955 \$10.95 Ppd.



Extraordinary For Telephoto Photography 24"-F. L. TESSAR WAR SURPLUS f/6 ANASTIGMAT LENS

This high-quality anastigmat lens was used in K-38 aerial camera. Between-the-lens shutter, manually operated, has speeds of 1/50, 1/100 and 1/150 sec. Lever operated diaphragm in front of lens has range of f/6 to f/22 (about 1" to 3 1/2"). Four-element lens system . . . clear diam. of front lens 4", rear 3 3/4". Camera picture size 9" x 18". Overall diam. of unit 7 3/8", wt. 16 lbs.

No. 70,809 \$55.00 Postpaid

Same Optical System as Above, but without shutter (from camera with electrically-operated, focal plane shutter). In cone 22 1/4" long. For 8" x 10" negative. Trans. Chgs. Coll. from California . . . shpg. wt. 50 lbs.

No. 85,059 \$59.50 Ppd.



BUILD A REPEATING PHOTO FLASH

Crystallize motion! Take repetitive exposures on a single negative that vividly portrays action. In a few evenings you can build this unique electronic flash that

comes close to being a one-piece, trick-photography workshop. Perfect for "strobing" any moving subject. Flash repetition rate adjustable between 5 and 30 flashes per second. Order this FT-218 flashtube (similar to one pictured on pg. 104) and we'll include complete directions as they appeared in Popular Science Monthly. Xenon-filled flashtube provides thousands of short-duration flashes approximating color of daylight. Anode voltage 900V. Max. input 200 watt seconds. Life greater than 8000 flashes.

No. 40,756 \$9.10 Ppd.

New! Photograph sports, wildlife, the heavens; take startling candid portraits 15X-60X ZOOM TELEPHOTO SCOPE

Acclaimed the world's finest zoom scope for photography, yet you can use it for ordinary viewing or target spotting too. Aim, focus, zoom . . . your favorite activities sprint to life in vivid closeups for your camera or your eye. Take even astronomical subjects (such as Saturn's rings and craters of the moon).

All you need is a single lens reflex camera, plus the proper camera "T"-compatible adapter and scope adapters sold separately below. Use fast black-and-white, color or haze-cutting, infra-red film for ultra-long-distance photos. On a bright, sunny day, with Tri-X film—at 15X you can shoot at 1/500 or 1/250 second at f/16. A conventional telephoto lens of 60X magnification would cost well over \$1,000, yet this scope gives no noticeable vignetting, even at 60X. You get enormous magnification in a small lightweight instrument.

Camera Adapters. "T" compatible. Connect SLR cameras as listed to telephoto adapter at left.

Camera	Praktica	Exakta	Miranda	Minolta	Nikon
Stock No.	40,960	40,959	40,958	40,957	40,956
Price, Ppd.	\$3.00	\$5.00	\$3.00	\$5.00	\$5.75

15X-60X Zoom Telescope SPECIFICATIONS

Magnification	15X	20X	25X	30X	40X	50X	60X
Aperture	f/16	f/22	f/28	f/32	f/45	f/56	f/64
Equivalent Focal Length for	1000	1400	1700	2000	2700	3400	4000
Conventional Lenses	mm	mm	mm	mm	mm	mm	mm
Angle of View	3° 2' 15"	1° 50'	1° 30'	1° 10'	65'	45'	45'
Field at 1000 yds.	160ft	120ft	95ft	80ft	60ft	50ft	40ft

TAKE LONG DISTANCE PHOTOS WITH YOUR CAMERA AND BINOCULARS (OR MONOCULAR) AND EDMUND'S CAMERA-BINOCULAR HOLDER

Every photographer has dreamed of taking long-distance shots impossible with his limited equipment. Previously, expensive telephoto lenses were required. Now, the Edmund Camera-Binocular Holder enables you to take extreme long-distance shots inexpensively. By using it with your own camera and binoculars or monocular, you bring faraway objects much nearer than with ordinary telephoto lenses. For example, your 35mm camera and 7x50 binoculars will bring distant objects SEVEN TIMES CLOSER than by using the camera alone.

Think of the hundreds of new shot-possibilities that are opened up. In nature study (especially bird study), at sporting events, political rallies, your own children playing unsuspectingly, etc. With this unit you can take color and black and white, still or movie pictures. No need for heavy, clumsy telescopic equipment.

This sturdily-built holder screws onto standard 1/4"-20-thread tripods. A rubber eyeguard is supplied to couple the binocular (monocular) eyepiece to camera lens thus preventing extraneous light from entering the system. Complete directions for its use with popular cameras are also included. The metal holder has an

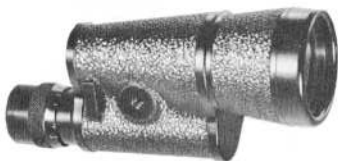


attractive, gray-wrinkle and chrome finish. A 1/4", 20-thread screw is included for use with threaded monoculars.

Monoculars used with this unit require either hinged lugs or a threaded socket for mounting on camera tripods. It will not take binoculars without center pins. Can be used with all still and movie cameras that have a standard tripod socket, adjustable aperture (f/stop) and adjustable shutter speed.

No. 70,223 \$12.50 Postpaid

MONOCULAR TELEPHOTO SYSTEM FOR USE WITH CAMERA-BINOCULAR HOLDER ABOVE



This popular 7x50 imported monocular has socket for attaching to any photo tripod. With holder above and either adapter below it makes an excellent telephoto system. Can be used with the following Edmund Binoculars: No. 1509, No. 1512, No. 1524, No. 1525, No. 1537 and Monoculars: No. 50,152, No. 70,639. Field of view 376 feet at 1,000 yards. Relative light efficiency 75. Exit pupil 7mm. Weight only 16 oz. With case, straps and directions. Step-up rings permit use with almost all cameras.

Series V camera-to-monocular adapter.

No. 40,680

1.50 Postpaid

Series VI camera-to-monocular adapter.

No. 40,769

2.25 Postpaid

SPECIAL SALE FOR SHUTTERBUGS & EXPERIMENTERS! BIG SAVINGS!

Four useful items purchased as manufacturer's surplus. We are passing the savings along to you. Buy now, supplies are limited.

(A) **Two Light Movie Bar.** Used for still and movie cameras. 9" bar, standard 1/4-20 thread screws. Uses 2 BEP or EBR 375 lamps (max. 750 watts). Also includes camera bracket; chart for lamp-subject distance, film exposure index and lens setting; 6 ft. cord and switch.

No. 60,685 \$2.25 Ppd.

(B) **Anastigmat Lens System.** Made for a stereo camera, but you can use it to build miniature enlargers and projectors. Mounted, F/3.5mm, 35mm F.L. Coated lenses have slot between elements for aperture stop.

No. 41,088 \$3.00 Ppd.

(C) **Pistol Grip Camera Holder.** A real Bargain! Only \$1.00. Made for a movie camera, but you can use it for any miniature camera. Standard camera threads. Handy mount for twin-lens and regular reflex cameras, instamatics, box cameras, strobe lights, etc.

No. 60,686 \$1.00 Ppd.

(D) **Anastigmat Stereo Camera Lens System.** Includes two F/3.5mm, 35mm F.L. coated anastigmat lens systems; 2 iris diaphragms (openings from F/3.5-F/22); 2 shutters, speeds T.B. 2-200. Irises and shutters work together. MFX Synchronic.

No. 41,087 \$9.00 Ppd.



VIEW FILMS AND SLIDES IN BRIGHT DAYLIGHT WITH LENSREEN

Lensreen, a new transmission-projection screen material composed of light-spreading transparent microcells, permits daylight presentations for both front and rear projection. Perfect for sales meetings, conferences, lectures, classrooms and home showings. No need to darken room. Ends stumbling around in the dark. Lensreen outperforms other daylight screens; gives rich contrasts, true color and sharp details. Elastic and flexible... folds and rolls with no creases. Easily stapled or tacked to a mounting frame. No "hot spots", resists fire and fungus, non-yellowing and unaffected by temperature and humidity. Reversible; matted side for normal light, glossy side for bright light. Instructions incl.

1 ft. x 1 ft. **No. 70,934 \$3.00 Ppd.** 3 ft. x 3 ft. **No. 70,935 \$20.00 Ppd.**

6 ft. wide sheets **No. 2508 \$12.00** per running ft. (2 ft. min.) **Postpaid**



LOW-COST, TABLE-TOP TRIPOD FOR CAMERAS, SCOPES, BINOCULARS, ETC.

Use this sturdy, portable tripod on a porch or other places where you prefer a lightweight, supporting base. Holds standard cameras with 1/4-20 thread. Ideal for close-up photography. Use it to mount

spotting scopes, binoculars, monoculars for "no shake viewing". Ball and socket joint has lock, allows approx. 150° movement in any direction. Legs have rubber feet. 834" opened height. Tripod comes already assembled.

No. 50,229 \$2.00 Postpaid



PHOTOGRAPHIC - PHOTO MOTION

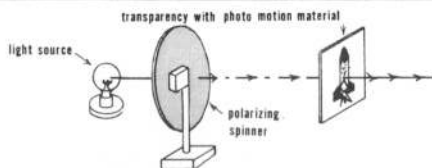


DIAGRAM A, SCHEMATIC OF PHOTO MOTION

New, amazing **PHOTO MOTION** technique does this in jig time... and it's so inexpensive when compared against the high cost of earlier methods. It's the progressive "come alive" material that arrests and holds interest... motion motivation. Welcomed by educators, lecturers, engineers, artists, designers, sign makers, hobbyists and all others who must create a receptive atmosphere for the communication of new ideas and concepts... use with overhead projectors, light boxes, displays, signs, etc.

PHOTO MOTION UTILIZES POLARIZATION AND REFRACTION OF LIGHT TO ACHIEVE THE ILLUSION OF MOTION. You can show moving functions of any type, engine, rocket or other mechanical device. It puts motion into flow patterns of air, fuel, water. You can dramatically illustrate rotation, radiation, expansion, contraction, explosions, lines of force, boiling liquids; the motion of light waves passing through optical instruments, etc. Pulsations of nerves, flow of blood in veins, heart action, are vividly shown. It has additional applications in the fields of art and display. Couple **PHOTO MOTION** with our Moiré Patterns and Color Filter Sheets for "way, way out" intriguing designs.

How does **PHOTO MOTION** work? A schematic in diagram (A) illustrates the elements (light source, transparency with photo motion material, polarizing spinner).

The screen image displays movement as long as the polarizing spinner revolves.

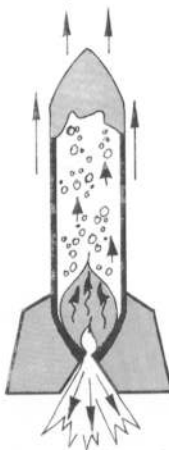
Diagram (B) shows a cut-away view of a solid fuel rocket. Arrows depict some of the dramatic movements **PHOTO MOTION** can add to the picture.

We said it was easy. First select the types of motion you wish to illustrate from the ten available. With a razor blade cut pieces to cover the areas you are motivating. Remove backing and check under the polarizing spinner to be sure the results are the ones you desire, then press adhesive side of cutouts onto transparency. A special, motion-reversing overlay sheet is also available. Add color to transparency with Edmund's Color Filter Sheets (Nos. 70,638; 60,403; 40,675 available at extra cost). A special, double-sided, adhesive, plastic sheet is available for this purpose. For the educator, engineer, lecturer and instructor who require all 10 available **PHOTO MOTION** effects plus reverse motion filter, we recommend our Advanced Kit:

PHOTO MOTION ADVANCED KIT. Contains one each, 2 3/4" x 2 7/8" pieces of material with self-adhesive backing which produce Linear Motion (fast), Linear Motion (slow), Turbulence, Bubbles (small), Bubbles (large and small), Flowing (checkerboard), Radiation (fast), Explosion (fast), Explosion (slow), Blinking, Reversing Sheet (use on back of above to reverse direction); Photo motion two-sided plastic adhesive sheet, 5 1/2" x 8 1/2", for attaching color filters; Razor Blade Knife; Tweezers; 6" x 6" sheet of Polarizing Material for spinner. Instructions. **No. 70,949 \$20.00 Ppd.**

PHOTO MOTION STARTER KIT. Includes one each 2 3/4" x 2 7/8" pieces of material with self-adhesive backing producing Turbulence, Bubbles (small), Radiation (slow), Rotation (slow), Blinking, Reversing Sheet; Tweezers, Two-Sided Plastic Adhesive Sheet, 5 1/2" x 8 1/2", Razor Blade Knife, 6" x 6" sheet of Polarizing Material for spinner. Instructions. **No. 70,950 \$10.00 Ppd.**

See inexpensive set No. 70,893 (below). Contains excellent motorized spinner with adjustable stand (for 35mm slides). Will adapt to larger size spinners. See polarizing sheets Nos. 70,419, 70,420, page 86, and how-to-do-it instructions.



8 1/2" x 11" PHOTO MOTION SHEETS... 14 DIFFERENT STYLES

Additional Photo Motion Material to augment your kit:

PHOTO MOTION TYPE	Stock No.	Price Ppd.
Linear—slow	70,952	\$14.50
Linear—fast	70,951	14.50
Rotation—slow	70,960	14.50
Rotation—fast	70,959	14.50
Radiation—fast	70,957	14.50
Radiation—slow	70,958	14.50
Explosion—slow	70,962	14.50
Explosion—fast	70,961	14.50

PHOTO MOTION TYPE	Stock No.	Price Ppd.
Bubbles—small	70,954	\$14.50
Bubbles—large & small	70,955	14.50
Turbulence	70,953	14.50
Flow—checkerboard	70,956	14.50
Blinking	70,963	6.00
Reversing	70,964	5.00
Adhesive Sheet (pkg. of 6)	70,965	2.00

See 44 different cellulose acetate, color filters in sheet form, pages 86 and 144.

BARGAIN! 35MM SLIDE MOTION POLARIZING SET COMPLETE WITH 8 COLOR SLIDES AND SPINNER

Original Cost \$87.00... Now \$9.00

For use with 35mm slide projectors, this specially priced (manufacturer's surplus) set is the most practical visual aid since the chalkboard. Movement in slide image, caused by rotating polarizing disc, holds audience attention. Can be adapted to advertising ideas, exhibits, demonstrations, classrooms, etc. Set includes 8 specially prepared 2" x 2" color slides (ear, heart, electrical circuits, electric motor, Geiger counter, sound reproduction, astronomical telescope, telephone) and polarizing spinner. 7" diam. spinner (with 1/2" rim) attaches to included 110-volt, 60-RPM motor mounted on adjustable, heavy based stand. Clear aperture of spinner covers projection lenses up to 2 3/4" diam. Teacher manual and storage box included.



IN USE WITH 35MM PROJECTOR

No. 70,893 \$9.00 Ppd.

DELUXE SPOTTING SCOPE with REVOLVING TURRET 15X, 20X, 30X, 40X ... BIG 80MM OBJECTIVE

Compare this scope with competitive models, even with scopes priced up to \$30. more. It has an excellent 80mm coated achromatic objective lens with light gathering power so great it picks out extremely faint objects under all lighting conditions, day or night. Even shows stars to 11th magnitude. F.L. 495mm. You will be pleased with the brilliance, sharpness of image and clear, trim detail . . . even at highest magnification. Four eyepieces on a revolving turret move into optical path at a flick of the finger. All optics are hard coated for increased light transmission.

Built-in, prismatic, erecting system; remote, body-mounted focusing ring with finger tip control; and panhead for quick adjustment. Sunshade can be extended to 3 1/2" beyond the objective lens . . . eliminates glare when looking in the direction of the sun or bright lights. Do not look directly at sun. "Dew-cap" included. Has sturdy metal tripod, adjustable from 9" to 14". Mounts on any standard photo tripod. Legs are wrinkle crackle finish; 9" extension rod is chrome plated. Folds compactly for carrying. 4 lbs., 4 oz. **No. 70,444 \$92.00 Ppd.**



Magnification	15X	20X	30X	40X
Field at 1,000 yds.	122 ft.	98 ft.	61 ft.	49 ft.
Diam. of exit pupils	5.4mm	4.0mm	2.7mm	2.0mm
Relative brightness	29	16	7	4

60mm objective spotting scope, same powers as above. Has 60mm achromatic objective. Prism erecting system, parafocal eyepieces, coated optics. Length 15", wt. 3 lbs. 4 oz. See table at right. **No. 70,194 \$62.50 Ppd.**

Magnification	15X	20X	30X	40X
Field at 1,000 yds.	122 ft.	98 ft.	61 ft.	49 ft.
Diam. of exit pupil	4.0mm	3.0mm	2.0mm	1.5mm
Relative brightness	16	9	4	2.25



5" SLEEKLY STYLED 10-POWER SCOPE

Perfect for nature lovers, sportsmen, birdwatchers—small but powerful. Big 30mm-diam. objective prismatic, right-side-up image. Hold it like a pistol—clamp it on car window—set it on its own 10" tripod—or simply slip wrist through strap and hold

scope in your hand. Includes: 1) tripod with tilting-panning head; 2) pistol grip; 3) screw-in wrist strap; 4) rubber-padded car window mount; 5) zippered case. Accessories take cameras too. Only 5 3/4" x 2" x 2"; wt. 7 1/2 oz. Focuses 20 ft. to infinity—field of view 215 ft. at 1,000 yds. Coated objective and eyepiece. Metal body has fine enameled, tan finish. Complete instructions included. **No. 70,775 \$26.95 Ppd.**

15-X, AMERICAN MADE SPOTTING SCOPE WITH ERECT IMAGE

Ideal for spotting 22 cal. bullet holes at long ranges, observation, sightseeing, etc. Contains a prism erecting system found only in the more expensive telescopes.

1 1/2" diam. objective gives outstanding sharpness, contrast and brightness in a wide field of view. Collapsible tripod has ball joint mount for quick setting on target. 8 1/2" tripod is equipped with rubber feet. Field of view at 1,000 yards is 150 feet. Overall length of telescope is 7".

No. 70,035 \$18.95 Postpaid



IMPORTED SCOPES

Handy erect image scopes with a lot of magnification. Will easily fit in your gun case, knapsack, etc. Coated lenses. Carrying cases included with both. 20x40 scope has 40mm diam. objective, field of view 2", ht. 10", length 9", wt. 1 pound. 30x60 scope has 60 mm diam. objective, field of view 1.4", ht. 11", length 13", weight 2 pounds.

No. 70,125	Spotting Scope, 20x40.	\$23.25 Postpaid
No. 70,124	Spotting Scope, 30x60.	\$28.50 Postpaid



20X TELESCOPE SPOTS 22 CAL. HOLES AT 100 YDS.

Field of view 62 ft. at 1,000 yds. Made of aluminum and chrome-plated brass. Recommended for daylight usage. Tripod not included. 1 1/4" diameter coated objective. Imported.

No. 50,006 \$4.75 Postpaid

10" Tripod for above. See complete description below.

No. 50,014 \$4.00 Ppd.



LOADS OF FUN! 6X to 18X Z-O-O-M TELESCOPE . . . PRICED LOW

Zooms from 6X to 18X and keeps excellent definition at all powers. Chromed slide tube . . . smooth focusing from infinity right down to 8 ft. Coated optics, 30mm-diam. objective. Aluminum body with 2-toned gray finish measures 1 1/4" in diam. x 10 1/4" long (extends to 12 3/8"). Easy to carry . . . wt. only 9 1/2 oz. Lens caps incl., but not tripod (order separately below). Imported.

No. 60,437 \$8.95 Ppd.

10" Tripod for above. Lightweight aluminum with steel clamp, rubber feet. Ball joint allows movement in all directions. Wt. 7 oz.

No. 50,014 \$4.00 Ppd.



RIFLESCOPES, TELESCOPES

40X GENERAL OBSERVATION TELESCOPE



**Still Only
\$9.95
Postpaid**

- Excellent for children . . . shows craters on the moon
- Low-cost target scope
- Use for watching distant objects

This inexpensive, erect image telescope for terrestrial viewing has a seven element lens system including a 40mm, achromatically corrected and coated objective. The ocular, of Ramsden design, has convenient slide focusing mount. Exit pupil is 1mm in diam. . . . should be used for viewing when good daylight conditions prevail. Not suitable for night viewing except for craters on the moon. Metal body tube, enamelled white, measures 28½" when extended and 25¼" closed. It is mounted in a sturdy metal yoke supplied with an elevation lock. Yoke pivots on 10" high chrome tripod equipped with rubber feet. Tripod legs fold together for carrying. The entire unit is packed in an attractive cardboard case equipped with carrying handle. We formerly sold 30-power telescopes similar to this one at \$14.95.

No. 70,018 \$9.95 Postpaid



POCKET-SIZED COMBINATION . . . 50X MICROSCOPE AND 10X TELESCOPE

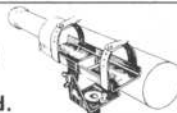
Clip holds it in your coat or shirt pocket. When used as microscope it will enlarge 50 times, making it possible to study insects, crystals, food particles, etc. Just tilt it to focus. Metal reflector throws light on the subject. As a telescope, you screw off the metal reflector, draw out the eyepiece tube to focus; then sight. Brings distant objects 10 times closer. Beautiful chrome and black finish.

No. 30,059 \$4.50 Postpaid

TELESCOPE MOUNT

Fits tubes to 5¼" in diam., and any photographic tripod. Zinc-coated metal. Top piece 6½" x 2".

No. 30,180 \$4.50 Ppd.



OPTICAL BLACK & WHITE PAINTS

New suede-finish enamels in 6-oz. spray cans for primed metal or wood. Black makes perfect light absorbing and diffusing surface for interiors of telescopes, cameras and other optical equipment, darkrooms, etc. White uniformly scatters incident light from any angle.

Black. **No. 60,608 \$2.75 Ppd.**
White. **No. 60,609 \$2.75 Ppd.**

WAR SURPLUS, INFRARED SNIPERSCOPES

These are Army Model M3 units in excellent working condition. Widely used in crime detection, painting forger detection, wild-life study, etc. Complete with power pack. See description, page 101.

HOMEBUILT RIFLESCOPES GUIDE BOOK

Gives designs for small and big game scopes and target scopes.

No. 9018 40c Postpaid

LENSES FOR 10X AND 14X TARGET SCOPES

Our booklet listed above gives complete spacing directions for these sets of lenses, also mounting suggestions.

10X Target Scope.

	Diam.	F. L.	No.	Price, Ppd.
Objective	42mm	147mm	40,618	\$3.25
Erector No. 2	18mm	103mm	6239	1.75
Eye Lenses (2)	26mm	104mm	6181	2.00 Coated

14X Target Scope.

	Diam.	F. L.	No.	Price, Ppd.
Objective	42mm	147mm	40,618	\$3.25
Erector No. 1	18mm	39mm	6358	2.00 Coated
Erector No. 2	18mm	103mm	6239	1.75
Eye Lenses (2)	26mm	93mm	6190	1.75 Coated



1X SCOPE BARGAIN

Mount this on your rifle as is, or rearrange the lenses to boost it to 3-power (or up to 8-power by adding a new objective lens). Just follow direction sheet included.

Unit power 1X, length 8⅞", weight 10 oz., tube diam. ⅞", eyepiece diam. 1¼", eye relief 4.384, field of view 60 ft. at 100 yds. Crossline type reticles not adjustable from outside. Govt. cost over \$65.00. Used, good condition, not coated.

No. 947 \$6.50 Ppd.



SALE

1X RIFLESCOPE . . . EASILY CONVERTS TO 8X

Complete illustrated directions included for converting to 3X without changing the lenses or up to 8X using lenses that can be purchased from us. Has military reticle. Length 8⅞", diameter ⅞".

No. 50,032 New, not coated. \$4.95 Ppd.

No. 50,031 Used, not coated. \$3.95 Ppd.

1X RIFLESCOPE, ENGLISH MADE . . . RUGGED

War-surplus brass scope similar to those above; used, but in good condition. Achromatic lenses. 1X (unit) magnification. 13" long x 1" diam.

No. 50,040 \$4.95 Ppd.

2½X RIFLESCOPE, WAR SURPLUS

Crossline reticle. Standard eye relief 3". Barrel diameter ⅞", length 8⅞", wt. 9 oz. Original cost \$69.00.

No. 50,048 \$15.00 Ppd.

Similar to No. 50,048, but with military reticle.

No. 50,118 With 1.8X magnification \$7.50 Ppd.

BAZOOKA PROJECTING RETICLE

Diameter 1½".

No. 2072 \$1.00 Ppd.

OTHER TELESCOPE LISTINGS

15X-60X Zoom Telephoto Scope, page 112.

Optical Alignment Telescope, page 95

10X Bore-sight And Alignment Telescope, page 96

8X Elbow Telescope, page 96

Infrared Sniperscope Field Collimator, page 101

Collimator or Parallel Light Source, page 95

B3 Gyro-stabilized Driftmeter, page 96

Reticles (War Surplus) for Telescopes, Transits,

Alidades, Collimators, etc., page 59

THE WORLD'S MOST INFORMATIVE CLOCK

CREATED BY DR. ATHELSTAN SPILHAUS

Dr. Spilhaus, one of America's leading scientists, took 5 years to develop this space-age astronomical clock. It is the modern counterpart to the old fashioned orrery. Large top dial has 5 transparent overlay discs. Four, rotating independently, combine with the fixed disc to capture the depth of the night sky and automatically show you 19 up-to-the-minute pieces of information related to time, the moon, sun, stars and tides.

SPILHAUS SPACE CLOCK

Read Top 8 1/2" Dial for . . .

1. The horizon and the visible heavens
2. The sun's position in the sky
3. Moon's position
4. Position of the stars
5. Relative positions of sun, moon & stars
6. Day, month, year. A perpetual calendar
7. Meridian solar-time of sun, moon & stars
8. Sidereal or star time (used with tables)
9. Current phase of the moon
10. Time of daily sunrise and sunset
11. Mean time of moonrise and moonset
12. Mean time of star-rise and star-set
13. Current time of high or low tide
14. Current stage of the tide
15. Mean solar time

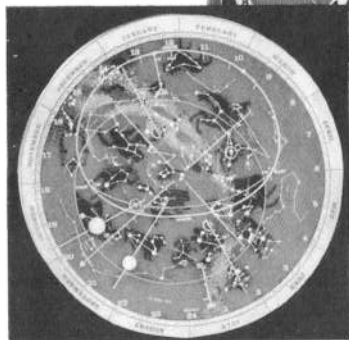
Lower Left 4" Dial shows . . .

16. Ordinary or zone time

Lower Right 4" Dial shows . . .

17. 24-hour time
18. Universal or Greenwich Mean Time
19. Time in major cities of USA and world (L.M.T.).

Illuminated Dials



- Home
- School
- Office
- Store
- Library
- Museum
- Club Room



A SPACE AGE INFORMATION CENTER—An up-to-the-minute encyclopedia of the skies for the home . . . for amateur astronomers, space enthusiasts, fishermen, boat and aircraft owners, shore residents, teachers, scientists.

UNIQUE GIFT, PRESENTATION OR AWARD—Will please anyone. For Father's Day, birthdays, Christmas, presentation or for the person who has everything.

CULTURAL ATTRACTION AT ANY LOCATION—Centerpiece for home, schools, libraries, museums, planetariums, weather and agricultural bureaus, laboratories, etc.

OUTSTANDING SCHOOL TEACHING AID—Science and astronomy teachers will find this an outstanding visual aid. Its vivid presentation of the essential facts about the universe will help them more than any text.

EXPERTLY ENGINEERED. Easily set for any location in the Northern Hemisphere. No periodic adjustments are necessary but a simple turning of the calendar dial on Feb. 29th each leap year. Original starting is very easy. Adjustments, if desired, do not interfere with other settings . . . all adjustment knobs are behind magnetically-held, matching back panel.

Clock is powered by heavy duty 115-V, 60-Cycle AC clock motor. Designed to blend with any decor, it is housed in a solid cherry case with fruitwood finish;

domed crystals. Brush finished brass top is lacquered for protection. Soft 3-point illumination, push-button control. Stands 15 3/8" high; cherry base is 11 3/4"x5" wide. "Lots of Time," an easily understood instruction book included. Shipping weight 13 pounds.

No. 1202 \$250.00 Transportation Charges Collect

For Foreign Countries. 220-Volt, 50-Cycle. Special order only. **No. 1203 \$275.00 Trans. Chgs. Coll.**

Other voltages and cycles available on special order.

"Lots of Time." 32-pg., illustrated instruction manual (5 1/2"x8 1/2").

No. 1300 Only 50c Ppd.

GUARANTEE

The Spilhaus Space Clock is guaranteed to be free from defects in materials and workmanship for one year.

NOW ALSO DISTRIBUTED NATIONALLY through exclusive jewelers, department stores, specialty gift and sporting good shops, marine and instrument dealers.

- REFLECTORS
- REFRACTORS
- MIRROR GRINDING KITS
- EYEPIECES
- CLOCK DRIVES
- FINDERS
- MOUNTS

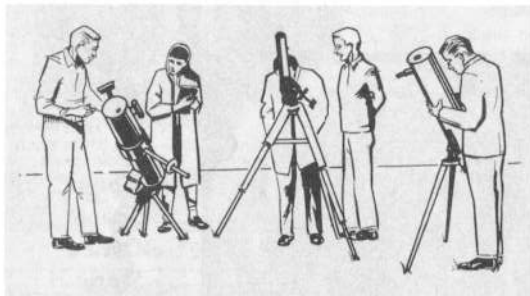


ASTRONOMY

ASTRONOMY AND THE FASCINATION OF DISCOVERY

The fascination of astronomy is there for those who have eyes to observe the incredible wonders of the universe. Few people are born who have not, if only for a fleeting moment, wished to know something more about it all. Descriptive books are invaluable as far as they go, but their full significance and interest is withheld unless the reader takes the next step of seeing things for himself . . . with his own or a borrowed astronomical telescope. You will be astonished.

Many amateurs begin their adventures in astronomy at quite an early age with inexpensive telescopes. As their interest grows, they acquire or build larger and more sophisticated instruments. Newspapers frequently report the observation of new comets and other phenomena by amateur astronomers. It is usually the consistent observer who is able to make such important discoveries. Astronomy can also provide valuable background material for a number of space age careers.



ASTRONOMY IS A POPULAR HOBBY

In this catalog are listed a variety of telescope models complete and ready for observation. Or, if you wish, you can build your own from parts . . . even grind the mirror. See listings on page 129.

Astronomy is a rapidly growing hobby and one popular with both sexes. No athletic skills are required to participate and enjoy it. Amateur observers have formed numerous groups to further their hobby. They offer the newcomer much valuable help in selecting and building equipment, also how to use it. Many hold very successful star parties for their members and friends.

Why not join the one nearest to you and partake of the fun.



THE SERIOUS AMATEUR

There is a great deal more to be learned about the stars, planets and outer space. The serious amateur can still play an important and valuable role. He may wish to specialize in observations of variable stars, meteor pattern detection, or studies of the planets. Your local astronomical society will gladly tell you about the areas where your help is needed.

If photography is one of your interests, try taking pictures through your telescope. Astro-photography is a fascinating subject and can become an intriguing specialty.

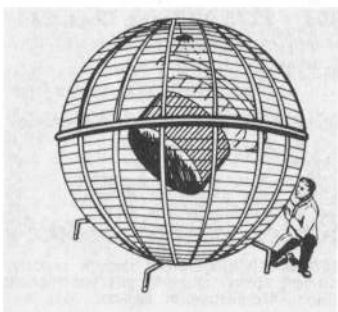
Many serious amateur astronomers prefer to build their own telescopes and incorporate features they have a personal preference for.



FAMILY FUN AND LEARNING

Observations through a telescope are just as much fun for parents as for children. Each describes and confirms what he has seen and learned.

Families take their telescopes with them on vacation. They observe areas of the heavens not visible from the latitude of their hometown. Building a telescope can be a family project, too. If you really want to start from scratch, begin by grinding and polishing your own mirror. A shared hobby of this kind develops interests that will help today's youngsters develop into the space explorers of tomorrow.



CAREER OPPORTUNITIES IN ASTRONOMY AND AERO-SPACE

It is natural that young people should give thought to a career which incorporates some of their interests, such as space exploration. Currently in its infancy, it has the prospects of further great growth in the years to come. Universities preparing for this growth now offer courses in astrophysics, radio astronomy, planetary and upper atmosphere research, rocket and satellite astronomy.

"A Career in Astronomy," a free brochure published by the American Astronomical Society is available in single copies from the Executive Officer, AAS, 211 Fitz Randolph Road, Princeton, N. J. 08540.

At the moment, the areas of rocketry and guided missiles offer opportunities in design, guidance, radio astronomy, astro-navigation, electronics, etc.

The National Aerospace Education Council, 616 Shoreham Bldg., 806 15th St. N.W., Washington, D. C. 20005, is another prime source of information. Outer space is one of our most important highways to the future.

WHAT YOU SHOULD KNOW

THE TRUTH ABOUT TELESCOPE POWER

Many beginners think about power or **Magnification** as the most important quality to look for in a telescope. Magnification is important, however, it is only one of three functions a good telescope is required to perform.

The second function is **Light Gathering Power** which increases the apparent brightness of an image. Large objectives (in refractors) and mirrors (in reflectors) are used to increase light gathering power from distant objects. **Resolving Power** is the third important function. In an astronomical telescope resolving power depends on the size and quality of the objective or reflecting mirror. The larger the diameter the greater its ability to show separately two closely adjacent objects; double stars for instance. You are also able to see detail on the moon, etc., better.

Theoretically, there are no limits to the amount of magnification you can obtain. In practice, however, high magnification presents four drawbacks: (1) Decreased clarity; (2) Decrease in image brightness; (3) Decrease in actual field of view; (4) Vibration amplification and difficult observation of stars close together.

Telescope experts agree that the top useful power is about 50X-60X per inch of objective aperture; that is,

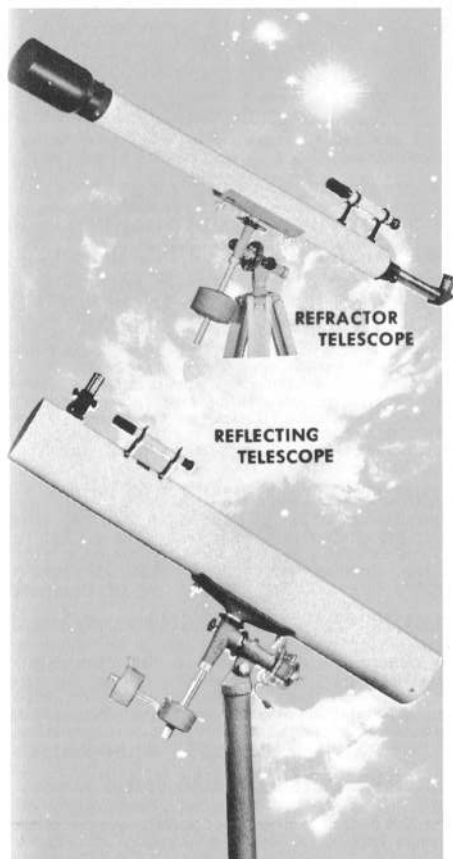
180X for a 3" telescope, 255X for a 4 1/4", 360X for a 6", and 480X for an 8". When you go beyond 50X-60X per inch, it amplifies everything including the diffraction patterns, heat waves, dust, clouds and air currents to the point of producing fuzzy images.

As mentioned, you can obtain higher magnifications than 60X per inch of aperture with any telescope. It is, however, empty magnification, with decreased resolution, and with little or no value to the observer. Many new companies have rushed into the astronomical field to profit from the increased interest. Fantastic claims are made about the greater power of their telescopes without mentioning the problems of high power.

Edmund Scientific attempts to maintain the factual and completely honest approach. The listed powers of our telescopes are based on the rule of 60X per inch, rather than on theoretical and unusable magnification.

For optical quality, you depend on the reputation of the manufacturer. The name of Edmund Scientific has been well known for years in the astronomical field as a dependable source for fine telescopes. Each is factually described in this catalog. No exaggerated claims are made. Each telescope is guaranteed to be exactly as described or we will refund your money in full.

WHAT KIND OF TELESCOPE SHOULD IT BE?



There are two basic types of astronomical telescopes. The refractor uses an objective lens and the reflector uses a mirror. The reflector mirror type, because of its economy, seems to be the most popular choice of the beginner.

THE REFRACTOR, OBJECTIVE LENS TYPE

In a refracting telescope an achromatic objective lens gathers the rays of light. At the other end of the tube a primary image is formed. It is this image which is magnified by an eyepiece. Such a lens system is difficult for the amateur to make because it requires accurate alignment, precise color correction and expensive materials. However, once made, it is easy to use since it requires no adjustments except focusing. The closed tube prevents the entrance of dust and moisture. We offer finished optical parts for such a telescope.

THE REFLECTOR (MIRROR TYPE)

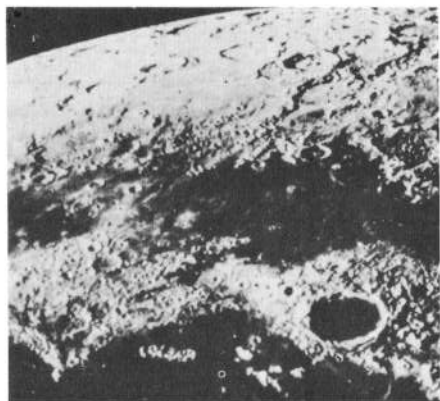
In a reflecting telescope, the image is "bounced" off a concave, aluminized mirror to a diagonal mirror. This, in turn reflects the image up through the eyepiece. The latter is generally located at the top or front end of the tube.

It is a great deal easier and cheaper for an amateur to grind and polish his own mirror or buy a finished one than it is to make or buy an objective lens of equivalent diameter. Assuming that the quality is good, the ability to resolve fine detail is usually a function of the diameter of the objective lens or mirror. Thus, with a reflecting telescope, you can see **more and better for less money and effort**. You may, of course, wish to do some reading on the art of building a reflector telescope and grinding your own mirror. If so, we suggest you invest in one of the fine books offered in this section.

WE RECOMMEND

Years of working with amateur telescope makers have taught us this. To make your own reflecting telescope, either by using already finished parts or by grinding and polishing your own mirror is quite practical. With reasonable care an amateur can produce a telescope as good as one purchased at quite a high price.

Note: Our finished 4 1/4" mirror is priced so low you may want to save time and buy one complete. If, however, you plan to build a 6" reflector, real economies are possible when you grind your own. We supply mirror blanks, grinding and polishing compounds, tool and instructions. See page 128 for outlined suggestions on the building of several fine quality reflectors.



THOUSANDS OF PEOPLE HAVE FOUND IT EASY TO BUILD THEIR OWN TELESCOPE

Starting on a small scale about 1925, there has been an ever-increasing group of amateur telescope makers in this country. They grind and polish their own mirrors, usually in the 6" diameter. They have designed and built instruments capable of following the movement of stars automatically, instruments powerful enough to have discovered new phenomena in the heavens, instruments, in short, that would cost hundreds of dollars if bought ready made. Yet many have been built by men, boys and women with no previous experience or ability! We have had photographs and descriptions of hundreds of telescopes completed by people of all ages and in all walks of life.

You can get started today by looking over our catalog pages and deciding which kit or parts you need.

EASY-TO-FOLLOW "BUILD-YOUR-OWN" BOOKS & BOOKLETS



MAKING YOUR OWN TELESCOPE . . . Thompson

An old standard for amateurs and a valuable addition to your telescope "know-how." Step-by-step coverage of mirror grinding, pitch lap, polishing, testing, correcting, the paraboloid, the diagonal, the finder, eyepieces, mounting, aluminizing, setting circles, optical principles, secondary reflections, etc. Cloth bound. 211 pages (5 1/4" x 8 1/4") with 98 diagrams and illustrations.

No. 9203 \$4.00 Postpaid

HOW TO MAKE A TELESCOPE . . . Jean Texereau

Written by the President of the Committee on Instruments of the Astronomical Society of France. Covers: basic principles, making the mirror, the plane diagonal mirror, the eyepiece, mechanical structure, the alt-azimuth mounting, accessories, mirror coating, adjustments, the telescope in use, photography with your telescope. Cloth-bound volume sold for \$4.00. Paperback. 258 pages (4 1/4" x 7 1/8") with 86 diagrams and illustrations.

No. 9355 \$1.45 Postpaid

Best Book Yet on Mirror Grinding for the Amateur! . . . Profusely Illustrated! . . . "HOME-BUILT TELESCOPES" . . . Page 143

Also "Telescopes You Can Build",
both by Sam Brown

MAKING YOUR OWN TELESCOPE

AN EASY, INEXPENSIVE HOBBY

A closeup of the moon, through a telescope you might make

It is true that ready-made telescopes are expensive. For instance, a good refractor with 4 1/4" objective lens would cost about \$250. But you can buy all the finished optical parts to make a powerful 4 1/4" diameter, reflecting telescope for only \$22.75, and you will see as much and as good as you would with the more expensive instrument. Tubes and metal parts can be purchased or made depending on your time and ability.

Some amateurs make every part of their telescope including grinding of the mirror. Others, limited in time, buy the completed telescope.



Grind your own mirror and save . . . it's great fun. Or assemble your telescope from Edmund's finished parts.

AMATEUR TELESCOPE MAKING THE THREE FAMOUS BOOKS BY INGALLS RECOGNIZED AUTHORITY ON THIS SUBJECT

This series of 3 clothbound books was compiled by Albert G. Ingalls, who for a great many years conducted the Amateur Telescope Makers column in Scientific American. They contain a wealth of information, including a symposium of articles on every conceivable subject connected with amateur telescope making.

Each chapter written in by an expert in his field. Some sample chapters are: "Mirror Making for Reflectors", "Making Eyepieces", "Accuracy in Parabolizing", "Simple Clock Drive", "The Spectrograph in Astronomy", "Lens Production", "Schmidt Camera Notes", and "Optical Bench Testing".

AMATEUR TELESCOPE MAKING, Book I

Complete information on astronomical telescope making including grinding your own mirror, testing and figuring.

Also includes articles on mountings, eyepieces, motor drives, observing, spectroscopes, celestial photography, etc.

No. 9208 \$5.00 Postpaid

AMATEUR TELESCOPE MAKING (Advanced), Book II

The serious amateur will want this in his library for sure. More advanced information on construction of optical instruments, testing, small lens making, refracting telescope objectives and mounting, drives for larger scopes, Springfield mounting and many other subjects are covered. Includes a total of 125 pages on observing.

No. 9209 \$6.00 Postpaid

AMATEUR TELESCOPE MAKING, Book III

The final book of the series. Covers spectrographs, diffraction gratings, Null test, optical flats, lens production, Barlow lens, lenses for astrophotography, Schmidt principle, etc.

No. 9224 \$7.00 Postpaid

SPACE CONQUEROR

3" REFLECTOR
60 TO 180
POWER



... Only
\$29.95 Ppd.

OUTSTANDING FEATURES

- ★ 3" ALUMINIZED MIRROR
- ★ 3X FINDER TELESCOPE
- ★ 1/2" F.L. EYEPIECE
- ★ BARLOW LENS
- ★ FORK-TYPE EQUATORIAL MOUNT
- ★ LIGHTWEIGHT TUBE
- ★ HARDWOOD TRIPOD
- ★ 1 BOOK, 1 BOOKLET, STAR CHART
- ★ DIRECTIONS

EXCELLENT "FIRST TELESCOPE"

This wonderful telescope is the ideal, low-cost introduction to astronomy and the mysteries of space and the stars. With it you can pursue a fascinating hobby. You can show your children the universe that will play such an important part in their future.

See Saturn's rings, Jupiter's moons, Mars, craters of the moon and the other wonders of the heavens. You will enjoy hours of educational fun. From a construction standpoint, the Space Conqueror embodies so many features experienced telescope enthusiasts consider necessary for viewing the heavens. You have all the magnification power you can use effectively. The instrument, sturdily made, easy to use, will provide years of enjoyment.

MIRROR . . . HEART OF YOUR TELESCOPE

Since the mirror is the heart of the telescope, it must be of fine optical quality. We are proud of this 3" aluminized, overcoated, 1/4" wave mirror. It has a focal length of 31", f/10, provides true viewing quality, easily aligned by means of three spring tension adjustment screws. Resolving power enables you to observe faint stars separated by as little as 3 seconds of arc. As for light gathering power, this quality mirror permits you to see stars to 10 1/2 magnitude.

3X FINDER . . . LOCATE STARS QUICKLY

Included with the Space Conqueror is a 3X finder telescope to help you quickly locate stars, planets, etc., for observation. See illustration.

60X EYEPIECE

You receive a 1/2" focal length 60X Ramsden eyepiece which provides more than enough magnification for viewing the wonders of the sky. In addition a Barlow lens which, when used with the 60X eyepiece, brings power to 180X, . . . about maximum effective magnification for this size of telescope.

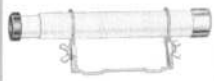
TUBE MOUNT AND TRIPOD

The tube is strong, spiral wound Kraftboard with an attractive white covering. The inside is dull black to prevent glare and reflections.

Fork-type equatorial mount has a 40° polar axis, a feature not found on other telescopes in this price range. It allows an observer to follow a star's movement with only one movement of the telescope . . . easy to keep the star in view. Tripod sturdily constructed of durable hardwood, 36" high.

Also included, "How To Use Your Telescope" (36 page book); "Handbook of the Heavens" (272 page book); Star Finder; "Star Paths," booklet.

No. 85,050 **\$29.95 Postpaid**



ACCESSORY EYEPIECES

1/4" F.L. gives 120X with Space Conqueror. 320X with Barlow.

No. 30,195 \$3.75 Ppd.

1" F.L. (31X) Excellent for terrestrial or lunar observation.

No. 30,194 \$3.50 Ppd.

3/4" F.L. (41X) War surplus, mounted, symmetrical eyepiece. Fine for wide field viewing and astro photography.

No. 30,315 \$5.95 Ppd.

4 1/4" PALOMAR - TYPE REFLECTOR TELESCOPE 45X TO 270X . . . Only \$84.50 T.C.G.

Compare the "Deluxe Space Conqueror" with any other make

- ★ 4 1/4" Spherical Mirror
- ★ 6X Finder Telescope
- ★ Two 1 1/4" Eyepieces
- ★ Rack & Pinion Focusing
- ★ Mounted Barlow Lens
- ★ 46" Aluminum Tube With Beautiful White Finish
- ★ True Equatorial Mount
- ★ 3" Setting Circles
- ★ Counter Balance
- ★ 24" Metal Pedestal
- ★ Full Instructions



Compare the Deluxe Space Conqueror with any other 4 1/4" reflector telescope. You'll find it stands far above them. It is the ideal telescope for the quality-minded beginner; the serious amateur who requires the features of ultra-expensive, professional instruments; schools or colleges starting to launch Space Age educational programs. American made.

The Deluxe Space Conqueror offers all the power that can be used effectively in an instrument of its size. With it you can see the craters and "seas" of the Moon, rings of Saturn, double stars, moons of Jupiter and many other phenomena. It is so powerful that with it you can read a newspaper headline at 1 mile.

The Deluxe Space Conqueror is easily portable. Many fine telescopes of 6" or more are stored in attics and cellars simply because they are too massive to be readily moved. This telescope is easy to carry to friends' houses, to vacation spots, to club meetings, etc. It comes complete . . . takes only a few minutes to assemble the mount and pedestal stand.

IMAGE ERECTOR FOR DELUXE SPACE CONQUEROR

For terrestrial viewing. Just attach to your eyepiece holder, insert eyepiece and focus normally. You see everything right side up and correct as to left and right. Two fine quality, coated achromats in polished, chrome-finished, brass tube—fits any standard 1 1/4" eyepiece holder. 9 1/2" long.

No. 50,276 \$9.95 Ppd.

WANT 540 POWER?

Experiment to your heart's content with this 1 1/4"-focal length eyepiece. Gives powers of 180 and 540 when used with our Barlow lens.

No. 30,204 \$4.75 Ppd.

DELUXE SPACE CONQUEROR

THE 4 1/4" SPHERICAL MIRROR is precision ground and polished, in adjustable mount, thoroughly tested and guaranteed to resolve detail right to the theoretic limit. Pyrex, aluminized, and overcoated.

The mirror has a focal length of 45" and is accurate to 1/4 wave. Note: This 4 1/4", f/10 spherical mirror will give the same desirable results as a parabolic mirror. (See page 191 of Thompson's MAKING YOUR OWN TELESCOPE for a complete description of its advantages.)

With the Deluxe Space Conqueror you can see stars with a magnitude of as much as 11.9. Has real light gathering power. Resolving power is 1.3 as compared to 3 seconds of arc of a 3" telescope. It is sturdily constructed, American made, will give years of service and it compares very favorably with telescopes costing much, much more.

6X FINDER TELESCOPE has achromatically corrected objective complete with light shade, Ramsden eyepiece in spiral focusing mount, cross hair reticle. Made of cast aluminum. Has adjustable mount.

INCLUDES 2 EYEPIECES AND MOUNTED ACHROMATIC BARLOW, American standard 1 1/4" diam. eyepieces which give a wider field.

Although power is a fetish with most beginners, practically all viewing is done with low-power eyepieces. We supply a deluxe 1" focal length, 45X Kellner achromat eyepiece and a 1 1/2" focal length 90X eyepiece. Included is a mounted Barlow lens, which, when used with the above, doubles and triples the power of each. This gives you additional magnifications of 135X, 180X and 270X, all you can possibly use.

EQUIPPED WITH 46" ALUMINUM TUBE. Provides a rigid mounting base for all components. It is lightweight and will last a lifetime. Beautiful white finish. Chrome nuts in mountings.

TRUE EQUATORIAL MOUNT enables you to track moon, stars, and planets with only one movement. It is completely adjustable to your own latitude. Correctly counterbalanced. Includes 2, 3" setting circles for recording exact position of observed object. Bearings provide ultra smooth movement. Large locking knobs insure quick and positive setting.

VIBRATION-FREE PEDESTAL BASE. 24" high provides a sturdy support. Eliminate wobble, torque or vibration. Made of heavy gage steel tubing.

No. 85,105 Complete \$84.50

Shpg. Wt. 42 lbs. Transp. Chgs. Coll.

DELUXE SPACE CONQUEROR WITH CLOCK DRIVE

Complete telescope as described on pedestal mount with electrical clock drive added (See page 139). Operates on 110V. Ideal for long or group viewing sessions because it tracks the object and you do not lose sight of it when changing viewers. Excellent for astro-photography.

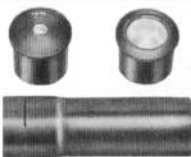
No. 85,107 Transp. Chgs. Coll. Shpg. Wt. 45 lbs. \$134.50

4 1/4" TELESCOPE WITHOUT MOUNT & PEDESTAL



Telescope tube, finder telescope, mirror, mirror mount, eyepieces ... everything but equatorial mount and pedestal. Assembled.

No. 85,113 Shpg. Wt. 10 lbs. \$66.00 Transp. Chgs. Coll.



FREE

With this telescope: How To Use Your Telescope, 36 pgs.; Handbook of the Heavens, 272 pgs.; Star Finder, Star Paths.

SUPER SPACE CONQUEROR

6" REFLECTOR
AMERICAN MADE
COMPLETE LINE OF
ACCESSORIES
48X to
360X



\$199⁵⁰

Transportation
Charges
Collect

**TEFLON BEARINGS,
IMPROVED DRIVE**

NO EXTRAS TO BUY . . . HAS ELECTRIC CLOCK DRIVE

A superb instrument. It includes electric clock drive, setting circles, heavy-duty equatorial mount and a pedestal base. It fills the demands that most serious amateurs, and schools place on a telescope. Shows you clearly and sharply Rings of Saturn, Jupiter's Moons, Mars, Craters of the Moon and all the wonders of the sky. It will reveal stars of nearly 13th magnitude, and split double stars separated by less than 1 second of arc. Its optical quality and stability have brought us many compliments. Compare it with telescopes costing \$295.00 to \$350.00. The Super Space Conqueror is one of the few telescopes priced to save you money without sacrificing quality. It will give many years of pleasure.

Pyrex Parabolic Mirror. This fine mirror is hand-finished to $\frac{1}{4}$ wave, corrected to the theoretical limit of resolution, aluminized and overcoated. Focal length 48", speed f/8.

8-Power Achromatic Finder Scope, in adjustable mount.

Three Standard $\frac{1}{4}$ " Eyepieces and **Achromatic Barlow.** We include a wide-field achromatic 48X Kellner, a $\frac{1}{2}$ ", 96X and a $\frac{1}{4}$ ", 192X Ramsden and a Barlow that will double and triple each of these magnifications giving you up to 576X. Eyepieces are positioned in a rack and pinion focusing mount.

Sturdy $4\frac{3}{4}$ " Long Aluminum Tube. Attractive exterior finish of durable baked white enamel. Inside is painted a flat black.

Heavy-Duty True Equatorial Mount. New teflon bearings, correctly counter-balanced . . . complete with 2, 3" setting circles for pinpointing stars.

NEW, IMPROVED Electric Clock Drive. New quick clutch with thumbscrew lock for telescope balancing, smoother operation, longer life. New manual **slow motion control** . . . lever-operated cam adjusts electric drive and permits precise tracking of stars at zenith or horizon. Ideal for long astro photography exposure or group viewing. **Full details on page 139.**

Rigid, All-Metal Pedestal Base is vibration and wobble-free. 24" high.

Included Free. As with every telescope we sell, you get the books and booklets "Handbook of the Heavens," "Star and Satellite Finder," "How to Use Your Telescope" and complete instructions.

No. 85,086 \$199.50

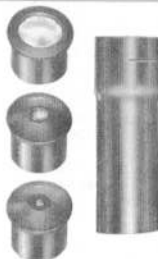
Trans. Chgs. Coll.
(Shpg. Wt. 68 lbs.)

Slow Motion Control Kit for Declination Axis. Allows direct and total correction (within 4° - 5°) for astrophotography, etc. Made of aluminum; easy mounting directions incl. (See pg. 139).

No. 60,574 \$18.00 Ppd.

EDUCATOR ACCEPTED

The Super Space Conqueror is ordered by many, many schools across the country. Completely accepted for purchase under NDEA.



OUR LARGEST AND BEST ...THE 8" REFLECTOR DESIGNED FOR SERIOUS AMATEURS, COLLEGES, SCHOOLS 64X to 480X and Higher



OUT- STANDING FEATURES

- ✓ Hand-corrected (better than 1/4 wave), f/8 parabolic Pyrex mirror with 64" F.L.
- ✓ Three, matched orthoscopic eyepieces
- ✓ Deluxe wide-field 5.5X finder telescope
- ✓ Improved Extra-Heavy-Duty equatorial mount with teflon bearings
- ✓ Now complete with setting circles.

\$389.

Transportation
Charges
Collect



Here is a telescope designed to meet the most exacting requirements of the serious amateur or the astronomy course requirements of schools and colleges. For the most ambitious astronomy programs, studies of galaxies, star clusters, nebula, etc. This 8" reflector offers nearly twice the light gathering power of a 6" and has a resolving power of .5 seconds of arc. The mirror is parabolic, Pyrex, and hand corrected to better than 1/4 wave. It is aluminized and overcoated. Included is a matched set of 4 element, orthoscopic eyepieces (6mm, 12.5mm, and 25mm) precision made and fluoride coated; also achromatic mounted Barlow lens. Although a pedestal base is supplied because of the true massiveness of the telescope a permanent mounting is recommended. The heavy-duty equatorial mount included is designed to mini-

mize vibration. A deluxe, wide-field 5.5X finder scope is provided. Setting circles included. 63" long phenolic tube. Here indeed is a reflecting telescope that will give many years of service. Complete including heavy-duty equatorial mount (described below) and pedestal base, 3 booklets. Star Chart and instructions. Shpg. wt. 200 lbs.

No. 85,143 \$389.00 Trans. Chgs. Coll.

Telescope only (no mount, drive, circles or base)

No. 85,144 \$277.00 Trans. Chgs. Coll.

Telescope, pedestal & mount complete with specially designed clock drive and setting circles (see illustration and brief description below).

No. 85,171 \$464.00 Trans. Chgs. Coll.

EXTRA-HEAVY-DUTY EQUATORIAL MOUNT FOR LARGER TELESCOPES

With clock drive and setting circles (specially designed for 8" telescope and available with this mount only). Function of clock drive similar to one described on page 139, except more sturdily mounted. Setting circles are big 5 3/4" in diameter. Hour circle is actually driven by clock to give more accurate tracking. New slow motion control on clock drive greatly aids locating and holding objects in view. Mount handles any telescope of this size, either of amateur or commercial design. This is not a souped-up 6" mount, but one specifically tailored to handle the massive 8-inches. It will fit any 6" and even hold 10" reflector models satisfactorily. Handles refractors up to and including the big 5" ones.

Mount has 1 1/2"-diam. polar and declination shafts with 1"-O.D. tip on polar shaft for mounting clock drive. Mount is made of cast iron for greater rigidity where it is most needed. Weighs a full 75 pounds including counterweights. Large teflon bearings reduce friction and permit exact balancing. Specially designed fine adjustment for latitude setting; positive shaft clamping. Mounts on standard 4" pipe. Important: give tube diameter of telescope when ordering. Shpg. wt. 85 lbs.

No. 85,172 \$191.00 Transportation Charges Collect

Mount with setting circles only (no clock drive).

No. 85,134 \$116.50 T.C.C.



RUGGED PEDESTAL BASE ONLY—AS SUPPLIED WITH TELESCOPE ABOVE

Cast iron post (4" I.D.) with three 2-ft. long feet; 30" high. Cap not incl. Wt. 85 lbs.

No. 85,145 \$32.50 Trans. Chgs. Coll.

ASTRONOMY - REFRACTORS

42MM REFRACTOR

67,100 AND
200 POWER



\$19.95 Ppd.

The achromatic, two-element objective lens of this telescope is color corrected and coated. Lens is 42mm (1 7/8") in diam., has 41" F. L. and excellent light gathering ability. Shows stars of nearly the 10th magnitude and small craters of the moon. Resolving power is approx. 3 seconds of arc. You also get: one 15mm F. L. 67X Ramsden eyepiece and a Barlow lens. Used together they give you from 100X to 200X; although at 200 power you will have some so called "empty magnification", since the objective is 42mm in diam.

The 38" long black tube is made of spirally wound paper plastic laminated for durability and beauty. Diagonal with first surface mirror eliminates bending and stooping.

Plated steel clamp provides sturdy mount that attaches to porch rail, post in ground, or regular photo tripod

using 1/4-20 thread. Tube glare-stops cut down on stray light and reflections. With instructions.

No. 80,061 \$19.95 Postpaid

Erector System. Gives right-side-up image of objects on the ground. Real fun for the beginner. Slides into one end of the focusing tube . . . cuts power in half when used one way, but reversed it doubles power.

No. 30,267 \$2.95 Postpaid

Eyepieces.

F. L. 1" (resulting power 41X). **No. 30,194 \$3.50 Ppd.**

F. L. 1/4" (resulting power 164X). **No. 30,195 3.75 Ppd.**

Tripod. Hardwood legs, 36" long and adjustable height post gives you a total height of 66". With cradle clamp.

No. 80,059 \$8.25 Postpaid

3" REFRACTOR TELESCOPE 45 TO 180 POWER AND HIGHER

See all the wonders of the sky in sharp detail. A few parts imported, but largely American made to precise specifications. Free Star Chart & Star Booklet included. 3", air-spaced, achromatic objective has been tested by famous astronomers and pronounced equal to any you can buy. Low reflection coatings on four surfaces, a 45" F. L., and speed of f/15.

Standard equipment includes 1 1/4" diameter eyepieces . . . one 1/2" F. L., 90X; one 1" F. L., 45X, and a mounted Barlow lens. The latter will double or triple the powers of each of the above eyepieces. This addition gives you extra powers of 135X, 180X and 270X. Eyepiece holder made of aluminum, brass and chrome plated, has a real smooth rack and pinion focusing adjustment. Equatorial mount with counterbalance gives you finger-tip control. Large 1 1/4" diam. knobs operate axis-lock mechanism. Easily adjusted for terrestrial viewing. Tripod legs,



\$125.00

**Transportation
Charges
Collect**

of natural finish hardwood, are 60" long, 40" main tube is white enameled aluminum with gray wrinkle finish . . . chrome finish on other parts.

Easily-read, precision setting circles, 6X optical finder telescope (with crossline reticle) in a double ring mount and prism star diagonal are included. Shipping Wt. 30 lbs.

No. 85,032 \$125.00 Trans. Chgs. Coll.

4" REFRACTOR

60 to 240 POWER AND HIGHER

With this 4" refractor you get a 6X finder, a sturdy equatorial mount, precision calibrated, easy-to-read setting circles, heavy duty tripod, eyepiece extension, star diagonal, three standard 1 1/4" eyepieces, a mounted Barlow lens, Star Chart and Star Booklet. With the Barlow lens, you can double and triple the powers of each of the eyepieces. This means you can obtain powers as high as 720! Such are fine for experimentation, though we do not recommend them for ordinary viewing.

Everything about this 4" refractor is massive. The mount is built of heavy iron castings with machined bearings for smooth operation. Tripod has extra-heavy, 60", hardwood legs. Weight of entire unit (42 lbs.) allows viewing so steady you wouldn't believe it possible.

The objective is a two element air spaced achromat with elements coated on all four sides to increase transmission and cut down reflection. It has a focal length of 60" and a speed of f/15. Fixed diaphragm stops are built in the telescope tube to cut down stray light.

Three standard 1 1/4" outside diameter eyepieces provide 60X, 120X and 240X. The eyepiece holder has a smooth rack and pinion focusing mechanism with 45° travel. An eyepiece extension, star diagonal, and Barlow lens are included. The latter doubles and triples the eyepiece powers mentioned above. Beautiful white tube.



\$247.00

**Transportation
Charges
Collect**

Gray, wrinkle finished, equatorial mount with setting circles is adjustable for all latitudes, has 1 3/4" knobs for positive locking. 6X finder has double ring mount.

All metal parts of this fine telescope are plated to prevent rusting. Shipping weight 58 pounds.

No. 85,038 \$247.00 Trans. Chgs. Coll.

Same Telescope with Electrically Motorized, Clock Drive on Mount. For 110-volt, AC current. See page 139.

No. 85,087 \$296.50 Trans. Chgs. Coll.

8X Refractor Telescope Kit

AN 8-YEAR OLD CAN MAKE IN ONE EVENING WITHOUT SPECIAL TOOLS . . . EXCELLENT FOR ASTRONOMY GROUP PROJECTS

Only \$3.00 Ppd.

Every boy or girl of today dreams of taking part in the exploration of outer space. This desire makes building his or her own telescope a real thrill. With this kit even 8 year old children can now build an 8X telescope.

It presents an ideal and attractive group project for scouts, junior astronomy clubs, or similar groups. (Note special quantity prices!) Scope is powerful enough to show craters of the moon, Jupiter's moons, and many stars not visible to the naked eye.

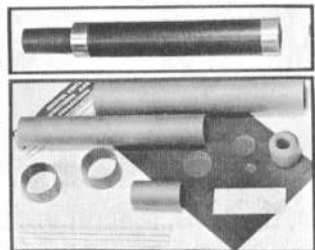
Kit includes objective lens, field lens, eye lens, glare stops, kraftboard tubes, cadmium plated metal ferrules, etc., to make an 18" long, 1 3/4" diameter telescope. Full instructions included.

No. 70,238 Complete Kit only \$3.00 Each Postpaid

Teachers, Scout Leaders, Club Presidents . . . Check these prices

No. P-70,239 Five complete 8X telescope kits \$12.50 Postpaid

No. P-70,240 Ten complete 8X telescope kits 22.50 Postpaid



2X, Erect Image Galileian Telescope. Used on the A10 sextant to magnify stars. Fixed focus. Measures only 2" long and about 1" in diameter. **No. 63 \$3.00 Ppd.**

DISCOVER THE STARS . . . Johnson & Adler

Paper bound, 146 pages. Beginner's guide to astronomy. Radio astronomy, navigation, solar energy, simple make-your-own instruments. Photographs and diagrams.

No. 9225 \$1.00 Postpaid

DICTIONARY of ASTRONOMY and ASTRONAUTICS

Concise definitions of over 2,200 terms and concepts related to these subjects. 439 pages.

No. 9238 \$6.00 Ppd.

5 GIANT, FULL COLOR ASTRO POSTCARDS

Mars, Jupiter, Saturn, a sun spot and a solar prominence. 5 1/2" x 7". **No. 40,398 Set of five. 50¢ Ppd.** Same views in 35mm (2" x 2") Color Slides.

No. 40,407 Set of five. \$1.50 Ppd.

NORTON'S STAR ATLAS . . . Norton & Inglis A HALLMARK IN ASTRONOMY REFERENCES

This, the 15th edition of this valuable reference hand book, contains 9,000 stars, nebulae and star clusters. Desirable lists of objects most suitable for viewing with small telescopes are included. Beautifully and intricately rendered star charts, 18 in all. Galactic charts redrawn on new Galactic co-ordinate basis. Includes information on the sun, moon and planets, new moon map in color with 300 named features, hints on observing, and a large list of astronomical definitions. The perfect volume for amateur and student astronomers. Hardbound. 90 pages (8 1/2" x 11").

No. 9234 \$6.50 Postpaid

"STAR MAPS FOR BEGINNERS," Levitt & Marshall

This popular book is one of the best available for beginning star-gazers. Twelve maps, one for each month, divide the sky into quadrants. Spiral-bound book. 47 pages (8 1/2" x 11").

No. 9359 \$1.75 Ppd.

ASTRONOMY . . . Dr. Fred Hoyle

Virtually a short course in nuclear physics, quantum theory and relativity. 400 illustrations, 320 pages. Hard cover, 8" x 10 3/4".

No. 9348 \$12.95 Postpaid

CELESTIAL OBJECTS FOR COMMON TELESCOPES

Two volumes by T. W. Webb, revised by Margaret W. Mayall. Shows you what to look for, how and where. Volume 1 covers the entire solar system with the exception of Pluto and the asteroids; many observing hints included. Volume 2, "The Stars" is the largest and finest collection of data available about celestial objects for moderate sized telescopes. Volume 1 has 27 illustrations, 255 pages. Volume 2, 19 illustrations, 351 pages. Paperbacks, 5 1/2" x 8".

No. 9349 \$4.50 Ppd.

ASTRONOMY MADE SIMPLE . . . M. H. Degani

192 pages (8" x 10 3/4").

No. 9229 \$1.95 Ppd.

FORTY 35MM SLIDES OF CONSTELLATIONS

An excellent introduction to 46 Northern Hemisphere constellations. Slides include the fainter background stars usually omitted from plotted star maps. Five seasonal and regional star map slides give a preview of the constellations which follow in order. One, for example, is entitled "Constellations of a Summer Evening" and presents the sky as it would appear to an observer facing south at 9 o'clock on the evening of Aug. 6. Approximate times on dates other than this can easily be calculated.

No. P-60,167 \$16.00 Ppd.

Ten Most Popular Constellation Slides from above set.

No. P-40,785 \$4.50 Ppd.

TWENTY-NINE 35MM SLIDES OF MOON

This highly informative series of black and white slides shows many interesting features of the moon's surface. Included are the full moon taken through Mt. Wilson's 100" reflector; Clavius, the largest and clearest Moon crater, photographed through the 200" reflector at Mt. Palomar. Recommended for students from the 6th grade up with some previous subject knowledge. Leaflet included gives complete descriptions of each of the slides . . . your presentation is already prepared.

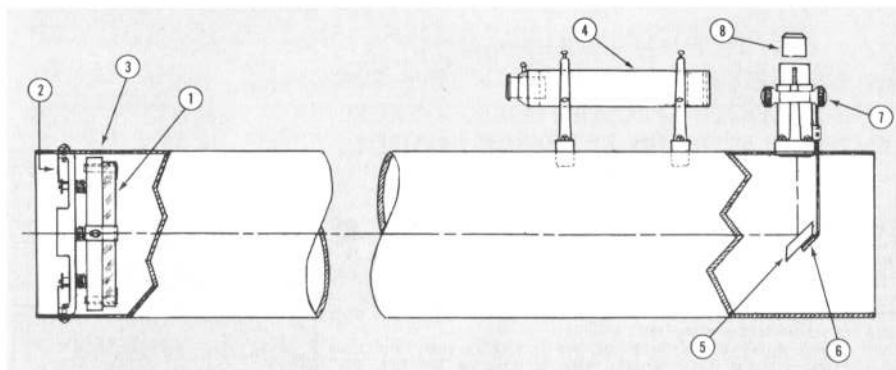
No. P-60,348 \$5.00 Ppd.

Be sure to see our other Astronomy Books on page 143 — Telescope Optics, Homebuilt Telescopes, Telescopes You Can Build, How to Use Your Telescope and Time in Astronomy.

50-PAGE ATLAS OF SPACE

By U. S. Naval Institute. 23 photos, 22 diagrams, moon map.

No. 9347 \$1.25 Postpaid



Guide for Building Your Own Reflector Telescope

YOU'LL NEED—1. OBJECTIVE MIRROR

This is the heart of your reflector telescope, so you will naturally want to choose it carefully.

Determine the diameter of mirror you want, such as 3", 4 1/4", 6" etc. Most amateurs make a 6" diameter mirror, although a few start with an 8" size. For mirror grinding kits and blanks see page 129. For finished mirrors and optical kits see page 130.

2. MIRROR MOUNT

This is another important component that should serve as a rigid support, yet be easily adjustable. You can make your own of wood or metal (referring to one of our instruction books on page 120), or purchase one from our own fine selection listed on page 131.

3. TELESCOPE TUBE

This can be of cardboard, wood, aluminum, etc. It should be painted black or "flocked" on the inside to cut bounced light to a minimum, and should have an inside diameter larger than your mirror. For example:

Mirror Size	Tubing Inside Diam.	Mirror Size	Tubing Inside Diam.
4 1/4"	4 7/8"	8"	9"
6"	6 7/8"	10"	12"

See our fine selection of tubing on page 131.

4. FINDER TELESCOPE

You use a 3X to 8X finder to locate the object you want to observe with your high-powered telescope. We have many fine-quality, inexpensive, war surplus lenses which you can use to make one of these. Or, you can buy one complete. See page 132.

5. DIAGONAL MIRROR OR PRISM

This directs the light rays of the image from the objective mirror into the eyepiece. It should be optically flat, aluminized and overcoated. Here, as with the objective mirror, the better ones are those polished to 1/4 to 1/8 wave accuracy. It is easier to buy than to make. See our own assortment on page 131.

6. DIAGONAL MIRROR OR PRISM HOLDER

We have inexpensive holders, also a fine quality brass holder which adapts to tubes from 5" to 9" I. D. and is adjustable. See our selection on page 131.

7. EYEPIECE FOCUSING HOLDER

This may be a simple sliding type or a rack and pinion focusing mount. See ours on page 131.

8. EYEPIECES . . . THEY MAGNIFY THE IMAGE

Usually eyepieces consists of two or more mounted lenses. A holder (draw tube or rack & pinion) focuses the image in the eyepiece. Quality is determined by make (Orthoscopic, Kellner, etc.), focal length (27mm, 40mm, etc.) and apparent field of view (50° 40', etc.) See pages 133-136 for our fine selection of each type.

9. TRIPOD AND MOUNT (Not Illustrated)

You can make either or both of these. We list tripods and a wide selection of mounts (altazimuth and equatorial . . . simple or complex), pages 138-139.

10. INSTRUCTION BOOKS See pgs. 11, 120, 143

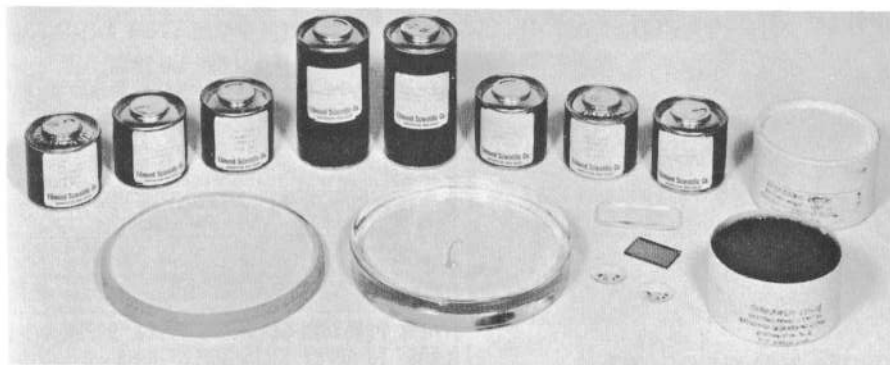
Four of the best are Thompson's, Texereau's, Ingalls' and Brown's "All About Telescopes."

SUGGESTED PARTS LISTS

All of these stock numbers are listed with prices in the Astronomical Section of this catalog

TELESCOPE PART	6" REFLECTING TELESCOPE	4 1/4" REFLECTING TELESCOPE	3" REFLECTING TELESCOPE
Image Erector	No. 50,276	No. 50,276	
Eyepiece Holder	No. 50,077 or No. 60,067	No. 50,077 or No. 60,067	No. 60,067
Diagonal Holder	No. 60,049 or No. 50,025	No. 60,035 or No. 50,025	No. 60,035 or No. 40,276
Diagonal Mirror	No. 30,188	No. 30,260	No. 30,259
Mirror Mount	No. 50,117	No. 50,079	No. 50,109
Tube (not drilled or painted)	No. 85,008 or No. 85,014 (for 48" to 54" F. L. mirrors)	No. 85,013 or No. 80,038	No. 80,056
Mounts and Tripods	No. 85,023	No. 85,023 or No. 85,009	
Mirror Kit	No. 70,004	No. 70,003	
Finished Mirror	No. 5002	No. 50,051	No. 50,082

Choose your eyepieces, finder, etc., from our wide selection listed on the following pages.
"Edmund has the Accessories to Improve Your Present Telescope Too"



COMPLETE MIRROR GRINDING AND POLISHING KITS . . . INCLUDE BLANK, TOOL AND ABRASIVES

The ultimate thrill for the amateur telescope maker is grinding his own mirror. It is a project requiring patience, but one that pays off in much satisfaction and a real saving in money.

Our kits make mirror grinding easy! Each kit contains a Pyrex mirror blank in the size listed, and plate glass tool used to grind the mirror; 2 lenses which only require mounting to give you an excellent 1" F. L. eyepiece; a fine quality finished and aluminized, first surface mirror diagonal; a magnifying lens for inspection.

We also supply 8 assorted abrasives from coarse to fine in shaker top containers, and tempered Burgundy pitch. We do not supply instructions, because successful results require detailed directions which can be found

only in books on the subject. See below. Mirror blanks in these kits are new and are fine annealed Pyrex. No. 7740.

Stock No.	Dia. Mirror	Thick.	Shpg. Wt.	Kit Price
70,003	4 1/4"	3/4"		\$ 8.00 Ppd.
70,004	6"	1"		12.95 Ppd.
70,005	8"	1 3/8"		21.00 Ppd.
70,006	10"	1 3/4"	30 lbs.	34.25 *T.C.C.
70,007	12 1/2"	2 1/8"	46 lbs.	65.85 *T.C.C.

*Transportation Charges Collect

QUALITY* ANNEALED PYREX NO. 7740 MIRROR BLANKS

Diam.	No.	Price	Thick.	No.	Price	Thick.
3"				40,037	\$1.25	3/8"
4 1/4"	80,016	\$3.25	3/4"	80,011	2.00	5/8"
6"	80,017	6.00	1"	80,012	2.95	5/8"
8"	80,009	10.00	1 3/8"	80,013	5.75	3/4"
10"	80,000	21.00	1 3/4"	80,014	12.00	1"

Items above shipped postpaid. The 3" and 4 1/4" tools can be used as mirror blanks if desired. Items below shipped Railway Express, Transportation Charges Collect.

12 1/2"	80,010	\$36.50	2 1/8"	80,015	\$16.00	1"
		Shpg. wt. 21 lbs.			Shpg. wt. 14 lbs.	

Annealing strain birefringence: 10 mu/cm of light path.

SPECIAL PYREX SCHMIDT MIRROR BLANKS

Here is a war-surplus bargain in a 6 3/4" diam. by 5/8" blank. Place for 1 3/4" diam. hole in center. . . glass here only about 1/8" thick so it can easily be cut if necessary. Made for mirror with radius of 7 3/4" (3 3/8" F. L.). Not polished.



No. 70,170 \$2.50 Postpaid

TEMPERED BURGUNDY PITCH

For making "pitch lap." A real trouble saver because no rosin or beeswax need be added. Big 1/2 pound container.

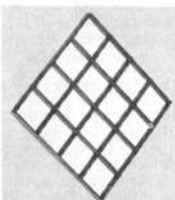
No. 40,023 Only 80c Postpaid

TELESCOPE OPTICS by Sam Brown

One of Sam's recent and most interesting books. Non-technical coverage of important basics such as: where is the image, homemade eyepieces, graphical ray tracing, etc. 32 pages. See complete details on page 143.

RUBBER PITCH LAP MAT TIME SAVING WONDER

Avoid all those disappointing break-outs of the pitch, common when hand cutting the channels. Pour the melted pitch on the tool, lay mat on top then press it in with your mirror to form channels. When pitch sets, an easy pull will remove the mat. In minutes instead of hours you are set to polish.



No.	Size	For Mirror	Price
50,171	13 1/2 x 13 1/2"	8", 10", 12"	\$2.50 Ppd.
60,061	6" x 6"	4 1/4", 6"	1.15 Ppd.

Template For Grinding 6", f/8 Mirror. Also sighting ring & collimating directions.

No. 40,316 50c Postpaid

ABRASIVES . . . IN SHAKER TOP CONTAINERS FOR MIRROR GRINDING OR INDUSTRIAL USE

Now! Abrasives in small quantities. The abrasives listed below, range from coarse to extra fine and should be used in the order listed. All are guaranteed free from contamination. Shakers help you to evenly distribute abrasive and reduce waste . . . last 4 for fast polishing.

Stock No.	Description	Quantity	Price, Ppd.
40,022	#80 Alundum	16 oz.	\$1.25
40,021	#120 Alundum	6 oz.	.80
40,020	#220 Alundum	4 oz.	.80
40,019	#320 Alundum	3 oz.	.80
40,018	#400 Alundum	3 oz.	.80
40,017	#600 Alundum	2 oz.	.60
40,016	#305 Emery	2 oz.	.60
40,015	Red Jewelers Rouge	8 oz.	1.00
40,152	Cerium Oxide	4 oz.	1.50
40,153	Cerium Oxide	8 oz.	2.75
40,158	Barnesite	4 oz.	1.60
40,159	Barnesite	8 oz.	2.80

ASTRONOMY - ACCESSORIES

OPTICAL KITS FOR REFLECTOR TELESCOPES . . . WITH COMPLETED MIRRORS



ASTRONOMICAL TELESCOPE MIRRORS

No.	Diam.	F.L.	Thickness	Price
40,913	2 1/2"	25"	3/8"	\$4.00 Ppd.
30,219	3"	18"	3/8"	7.65 Ppd.
50,082*	3"	30"	3/8"	7.65 Ppd.
50,051*	4 1/4"	45" Pyrex	3/8"	21.00 Ppd.

Parabolic Pyrex Mirrors				*Transportation Charges Collect
No.	Diam.	F.L.	Thickness	Price
5002	6"	48"	1"	\$59.50 Ppd.
85,069	8"	64"	1 3/8"	89.00* T.C.C.
85,070	10"	80"	1 3/4"	179.00* T.C.C.
85,071	12 1/2"	100"	2 1/8"	275.00* T.C.C.

NEW PRESSURE-SENSITIVE FLOCK PAPER . . . EASY TO APPLY, KILLS REFLECTIONS

New Flock-Stick paper with pressure sensitive back is the ideal material for lining telescope tubes. Just peel off backing and apply. Whether you are building your own telescope or would like to improve the performance of the one you own, Flock-Stick will do the job—quickly. Black, velvet-like non reflecting surface provides millions of light traps and makes this material far superior to flat, black paint. In 20" x 30" sheets.

Single sheet **No. 70,621 \$2.00 Ppd.**

Pkg. of 50 sheets. **No. P-70,622 \$65.00 Ppd.**

Non-Adhesive 27" x 36" sheet. **No. 60,068 \$1.00 Ppd.**

See Jet-Black, Light Absorbing Fabric on Page 105. Excellent for lining optical instruments. Smooth, velvet like rayon pile, won't fade.

RACK & PINION

HELICAL GEAR SHAFT AND KNOBS



Far superior to straight rack and pinion. Big advantage is smoothness of operation. Steel shaft and helical gear are in one piece. Brass bushings included. 14 teeth per in., face .236", Pressure angle 14 1/2", Pitch 14, Shaft diam. .177", Length 2 3/8". Gear O.D. .275".

No. 40,197 \$1.50 Ppd.

BRASS HELICAL RACK. Meshes with gear above.

No. 40,196 Length 3 3/8" \$1.25 Ppd.

No. 40,195 Length 11 3/4" 2.50 Ppd.

RACK & GEAR FOCUSING MECHANISMS

Spur gears have 1/8" face, pressure angle of 14 1/2° and a pitch of 48. Other specifications in table below.

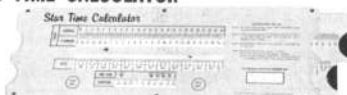
BRASS SPUR GEARS

No.	O. D.	Hole Size	Teeth	Price Ppd.
40,055	1 1/4"	3/32"	10	\$1.35
40,056	1 3/4"	1/8"	12	1.35
40,057	2 1/4"	1/8"	14	1.35
40,058	3 3/8"	1/8"	16	1.35
40,059	2 3/4"	1/8"	15	1.35

BRASS RACKS

No.	Size	Price Ppd.
40,060	4"	\$1.00
40,054	6"	1.50
40,053	12"	2.65

STAR TIME CALCULATOR



This handy slide rule automatically makes the conversion from star or sidereal time to standard time. Saves the amateur astronomer time and many mathematical calculations. Attractive, plastic-coated cardboard rule measures 10 3/8" x 3 3/8". **No. 40,399 \$1.50 Postpaid**

Forget the grinding if you like . . . these kits have all the optics you'll need

Make your own precision reflecting telescope with these kits containing a finished mirror, eyepiece lenses, diagonal and complete instructions. Kits do not include tubes, mounts, etc. You'll find tubes listed on page 131, mounts, tripods, clock drives on pages 138-139.

3" MIRROR TELESCOPE OPTICS KIT

All the optical parts you need to make a powerful, astronomical reflector telescope: (1) 3" diameter mirror, 30" F.L., ground and polished to 1/4 wave length, aluminized and overcoated with silicon monoxide. (2) First surface, aluminized, diagonal mirror (1/2" x 3/4") (3) Two, plano-convex lenses to make a 1" F.L. Ramsden eyepiece. Gives 31X, and this can be greatly increased by purchasing shorter F.L. eyepieces or a Barlow lens. Directions for spacing, mounting, etc. Dir. Incl.

No. 50,081 \$9.95 Postpaid

4 1/4" MIRROR TELESCOPE OPTICS KIT (Illustrated)

Same parts as above except 4 1/4" Pyrex mirror included has 45" F.L., is ground and polished to 1/4 wave length, aluminized and overcoated with silicon monoxide. Gives 45X which can be greatly increased by purchasing shorter F.L. eyepieces or a Barlow lens. Aluminized diagonal mirror measures 25mm x 35mm. Dir. incl.

No. 50,074 \$22.75 Postpaid

SETTING CIRCLES HELP RECORD OBSERVATIONS BLACK PLASTIC SETTING CIRCLES SET

8"-O. D. Size. These 1/8" thick circles have sharp white figures. Alternate black and white blocks designate divisions, allow easier reading. Center hole is 1/4". Declination circle has 360° divided into 1° blocks. Reads from 0 to 90 to 0 to 90 to 0. Right Ascension circle has 5 minute blocks with 24 hours scale divided into two different scales on the same side. One reads from 0 to 6 to 0 to 6 to 0 hours, and the other 1 to 24 hours consecutively. Instructions included. Complete set.

No. 50,133 \$3.00 Ppd.

Declination Circle only. **No. 60,078 \$1.60 Ppd.**

Right Ascension Circle only **No. 60,079 1.60 Ppd.**

5 3/4"-O. D. Size. Similar to above. Complete set.

No. 50,190 \$2.50 Ppd.

DELUXE ALUMINUM SETTING CIRCLE SET

Smoothly finished aluminum 4" in diam. x 1/2" thick. Edge engraved and filled with black. Center hole is 1"; can be enlarged to fit your telescope. Locking set screws, 4 brass pointers, 2 adjustable pointer clamps and booklet "Time is Astronomy" included.

No. 50,246 \$18.00 Postpaid

As above, but with 2 1/4" diam. center hole to fit our 8" reflector telescope mount (Nos. 85,143; and 85,134 only). With "Time and Astronomy." **No. 60,221 \$18.00 Ppd.**

BASIC PARTS FOR BUILDING ASTRONOMICAL REFLECTOR TELESCOPES

GOOD QUALITY MIRROR MOUNTS

3" An excellent low-cost mount. Unassembled, with directions. Outer diam. 3 1/2". Fits our No. 80,056 cardboard tube or No. 85,012 aluminum. Shims not included.

No. 50,109 \$2.95 Postpaid

4 1/4" Adjusting clamps act on mount alone. Metal clips hold mirror to mount. 3-point suspension. Mount O. D. 4 7/8". Fits our No. 85,013 alum. tubing, can be shimmed for No. 80,038 tube. Unassembled, with directions.

No. 50,079 \$3.95 Postpaid

6" Cast aluminum. Completely assembled. Metal clips hold mirror firmly. Outer diameter of mount is 6 1/16". Fits tubing No. 85,014 alum. or No. 85,008 cardboard.

No. 50,117 \$7.50 Postpaid

8" Cast aluminum, assembled. Metal clips to hold mirror. O. D. 9". With shims (not included) will fit our tubing No. 85,139 cardboard or No. 85,146.

No. 70,072 \$10.50 Postpaid



DELUXE QUALITY MIRROR MOUNTS

Cast aluminum flotation cells support mirror at 9 points. Positive collimation lock. Primed and painted black.



No. 70,537 (For 10", 12" O.D.) \$39.50 Ppd.

No. 70,538 (For 12 1/2", 15" O.D.) 48.50 Ppd.

No. 19,034 (For 16 1/2", 20" O.D.) \$130.00 T.C.C.

QUALITY ELLIPTICAL MIRROR DIAGONALS

1/4 wave for 6" telescopes

These are ground and polished to 1/4 wave length, aluminized and overcoated. Just the right size for an F/8, 6" diameter telescope using normal focal length eyepieces. Size: major axis 1 3/4", minor axis, 1 1/4". Thickness 3/8".

No. 30,188 \$3.75 Postpaid



1/2 WAVE FOR 6" TELESCOPES

Same size as 1/4 wave mirror above, but ground and polished to 1/2 wave length, aluminized and overcoated.

No. 30,205 \$5.00 Postpaid

LARGE SIZE TO 1/4 WAVE LENGTH

Size needed when eyepieces with 1 1/2" F. L. or longer are used. For use with an F/8, 6" diameter mirror, or 8" diameter mirrors with normal focal length eyepieces. Size: 1 1/2" minor axis, 2 1/4" major axis. Thickness 3/8".

No. 30,258 \$5.75 Postpaid

OTHER SIZES TO 1/4 WAVE OR BETTER

No. 30,259 (7/8 x 1 1/4" x 1/8" thick for 3" scope) \$3.50

No. 30,260 (1 1/16 x 1 1/2" x 1/8" thick for 4 1/4" scope) 3.75

No. 30,261 (1 7/8 x 2 1/4" x 3/8" thick for 8", 10" scopes) 12.00

MIRROR DIAGONALS AND MOUNTS

For 4 1/4" telescope. Aluminized and overcoated mirror. Cemented to 43/64" rod and holder. Mirror face measures 25 x 34mm.

No. 60,086 \$3.00 Postpaid

For 3" telescope. Mirror diagonal cemented to angle bracket. Mirror face 21 x 29mm.

No. 60,087 \$2.25 Postpaid

SPIDER MOUNT FOR REFLECTING TELESCOPE

This versatile brass, 4-legged spider mount is adaptable to telescope tubes from 5" to 9" I. D. takes mirror or prism. Plate is mounted on exact 45° angle, measured 1 1/2" x 2". It is adjustable with set screw. Complete instructions included.

No. 50,025 \$4.25 Postpaid



EYEPIECE MOUNTS

1 1/4" RACK AND PINION

ONLY \$9.00

A real rack and pinion focusing mount at an amazingly low price. Takes standard 1 1/4" eyepieces. Micrometer-smooth focusing action, travel 2 1/4". Two focusing knobs, variable tension. Four mounting holes for greater rigidity, nuts and bolts included. Black wrinkle finish cast aluminum. Chrome tube. Diagonal holder not incl.

No. 50,077 \$9.00 Ppd.



DIAGONAL HOLDERS

No. 60,035 For 3" to 4 1/4" telescopes

\$1.00 Ppd.

No. 60,049 For 6" telescopes

\$1.00 Ppd.

STANDARD 1 1/4" SLIDE FOCUS

Here is an economical eyepiece and diagonal holder made of plastic. The unit includes 3" long chrome plated focusing sleeve also locking screw for diagonal. Diagonal holder in illustration is extra and not included.

Diagonal holders listed above fit this holder, and we suggest those.

No. 60,067 \$2.50 Postpaid



TELESCOPE TUBING . . . ALL SIZES

No.	I. D.	O. D.	Lgth.	Description	Wt. Lbs.	Price
80,056	3 7/16"	3 3/4"	32"	Spiral paper	*1 1/2	\$2.25
80,038	4 7/8"	5 1/4"	46"	Spiral paper	*6	3.80
80,081	1 7/8"	2"	48"	Aluminum	*3	4.00
85,008	6 7/8"	7 3/8"	60"	Spiral paper	+10	4.00
85,011	2 7/8"	3"	48"	Aluminum	+5	6.00
85,012	3 7/8"	4"	60"	Aluminum	+6	8.75
85,013	4 7/8"	5"	46"	Aluminum	+6	9.00
85,014	6 7/8"	7"	60"	Aluminum	+22	15.00
85,139	9"	9 3/4"	72"	Spiral paper	+22	12.00
85,146	9 1/4"	9 1/2"	63"	Phenolic	+10	30.00

(*Postpaid in U.S.A. only.) (†Trans. Chgs. Coll.) See Flock Paper on page 130.

TELESCOPING CARDBOARD TUBES

Sturdy Kraft with blackened inside. Each nests into next one. Wall thicknesses 1/16" to 1/4". I. D.'s: 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2", 1 3/4", 2", 2 1/4", 2 1/2", 3".

Twelve 3-ft. pieces.

No. 80,042 \$8.00 Ppd.

Twelve 18" pieces.

No. 60,501 4.50 Ppd.

Twelve 9" pieces.

No. 60,502 2.50 Ppd.

BLACKENED BRASS EYEPIECE TUBING

The three diameters listed will give you a slide fit when used together. Use them as eyepiece, focusing tube and holder respectively. (See retaining rings on page 78).

Stock No.	Length	I. D.	O. D.	Price, Ppd.
117	3"	1 3/16"	1 1/4"	\$1.80
118	2"	1 1/4"	1 5/16"	1.50
40,161	3"	1 5/16"	1 3/8"	1.80

ADJUSTABLE CLAMPS

Fine stainless steel hose clamps perfect for connecting 3/4" to 1 1/2"-diam. tubing. Cut and bolt to handle other sizes. Pkg. of 2.

No. P-60,604 \$1.25 Ppd.



ASTRONOMY - FINDERS

TELESCOPE FINDERS

7-POWER FINDER

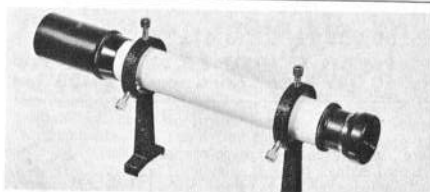
This 7X finder has 30mm diam. coated achromatic objective, Ramsden eyepiece, glass cross line reticle. Measures 8" long x 1½" O. D., weighs 8 oz. Tube is black anodized aluminum. Slide focusing eyepiece mount has locking screw.



FINDER RING MOUNTS ILLUSTRATED ABOVE

Lightweight rings measures 2" I. D. Each has 3 thumb screws for adjusting finder. Cast aluminum construction. Supplied complete with nuts and bolts for mounting on any size telescope.

No. 50,075 Per Pair \$3.95 Postpaid



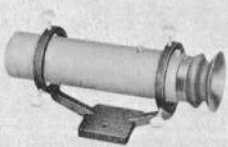
EDMUND 6X FINDER TELESCOPE

A low-cost, good quality finder complete with adjustable ring mounts. Telescope is white enameled aluminum, has coated optics, spiral focusing achromatic objective with lightshade. A Ramsden eyepiece (thread focusing) includes wire crosslines. Mount is cast aluminum with wrinkle finish and will fit any size telescope. Clear aperture of objective 23mm. Length approximately 9". Weighs less than 8 oz.

No. 50,121 \$8.50 Postpaid

6X DELUXE FINDER

This DeLuxe finder is a very impressive accessory. The telescope with glass crossline reticle is similar to finder on our \$389, 8" reflector (pg. 125). The objective, 50mm diam., offers excellent light gathering power. Wide-angle eyepiece gives exceptionally large field. Twin ring mount, described below, has three adjusting screws for each ring. You can always remove finder for use as a Richest-Field telescope and easily recenter it. Can be mounted on any diameter telescope. Complete with mount.



No. 70,175 \$32.50 Postpaid

SINGLE BASE TWO-RING FINDER MOUNT

Same as supplied on Deluxe Finder above. Unit is all in one piece. Takes up to 2¼" O. D. tube. Each ring measuring 27½" I. D., has 3 adjusting screws. Overall length is 6½", height 5". Cast aluminum, black wrinkle finish.

No. 70,079 \$9.95 Postpaid

LOW COST

3X FINDER

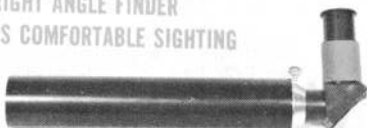
(Now supplied on 3" Space Conqueror)

Has 31mm objective lens (PCX 31 x 152) in spiral-wound Kraft tube with slide-focus eyepiece. Measures 8½" long x 1¼" outside diameter. Complete finder.

No. 60,363 \$3.00 Postpaid



7X RIGHT ANGLE FINDER GIVES COMFORTABLE SIGHTING



More comfortable and convenient to use than the straight finder scope. Can be mounted close to the telescope eyepiece for fast shifting of eye from finder to telescope. 30mm diam. achromatic objective, Ramsden eyepiece, glass crossline reticle. Black, anodized aluminum tube measures 8" long x 1½" O. D. Eyepiece is slide focusing with set screw for locking in place. (Our ring mounts **No. 50,075, \$3.95** per pair, are the correct size for this finder.)

No. 50,249 \$11.50 Postpaid

TELESCOPE LIGHTING UNIT



Helps preserve your night vision. Fasten to tripod leg. Two 39" cords, each with grain of wheat lamp and housing. One lamp is controlled for brightness by a rheostat for illuminating crosshairs. The other cord and lamp can be used to illuminate setting circles, eyepieces, charts, etc. Takes "D" battery (not incl.).

No. 50,219 \$2.95 Ppd.

EDMUND'S IMPROVED CLOCK DRIVE NOW HAS SLOW MOTION CONTROL . . . PAGE 139

RUBBER EYEGLASSES

Excellent war surplus rubber eyeguards for many optical instruments. Will stretch slightly for fitting. Styles vary from illustration.



Fits	Hole Diam.	Height	Stock No.	Price Ppd.
Elbow				
Telescope	1½"	2¼"	60,099	75¢
(Illus.)	1⅞"	1¾"	40,258	75¢
M-38 gun-sights etc.	1⅞"	1¼"	60,100	75¢
	1"-1⅞"	1"	40,967	75¢

FOCUSING KELLNER EYEPIECE . . . 1¼" F. L.

Make a finder telescope using this war surplus focusing eyepiece. Brass cell is 2¾" long and has 1⅞" O.D. threads. With diopter scale and cross-line reticle which can be lighted with grain of wheat bulb. All optics coated.

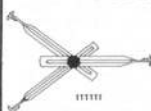
No. 60,400 \$9.50 Ppd.



Reduced Price . . . Mounted, Wide-Angle Kellner Eyepiece Was \$13.50 . . . Now Only \$8.50

This fine, war surplus eyepiece has 2 coated achromats. Ideal for a rich field telescope or a wide angle finder scope. 70° field of view, 42 mm. focal length, O.D. of barrel 2⅜", clear diam. of field lens 1⅞", clear diam. of eye lens 1½". **No. 60,234 \$8.50 Ppd.**

LOCK TRIPOD LEGS WITH METAL BRACE



Use this inexpensive adjustable metal brace to lock your tripod (scope or camera) legs. Bakelite knob and wing nut lock legs quickly and securely. Attaches in minutes, wood screws included.

No. 50,232 \$3.00 Ppd.

EYEPIECES ... THEIR DESIGN, FUNCTION AND USE

Selecting the best eyepiece for your telescope is an important project. The ratio of the focal length of the objective to that of the eyepiece determines the power. The purpose of the eyepiece is to magnify the primary image formed of some distant object by the objective or mirror. The image rays, as they travel through the eyepiece system, are compressed into an almost parallel bundle. Field of view is also determined in part by the eyepiece.

(A) **Symmetrical.** Two identical achromats spaced a small distance apart.

(B) **Concave Lens.** Used in Galilean telescopes. Only type that gives erect image. Good only for extremely low power. Very narrow field of view. Single simple lens.

(C) **Ramsden.** Two plano-convex or double-convex lenses. Economical type. Real image formed in front of field lens. Field 35° to 45°. Two simple lenses.

(D) **Orthoscopic.** Triplet field lens and simple plano-convex eye lens. Excellent color correction and wide field . . . 35° to 50°. Found only on very expensive scopes.

(E) **Huygenian.** Note image plane falls between lenses. Better color correction than the Ramsden. Excellent for microscopes and telescopes. Field 25° to 40°.

(F) **Kellner.** Achromatized Ramsden for better color correction. There are several variations of this type. Field 40° to 55°. The most popular type for telescopes.

(G) **Erfle.** An eyepiece especially designed for extra-wide field with good correction of all aberrations. Field from 65° to 70°. Usually quite expensive.



COMPLETE SELECTION ORTHOSCOPIC EYEPIECES

- Wide Flat Field
- Best Correction At High Magnification
- Excellent Eye Relief
- Coated Optics



Because of its triplet the Orthoscopic eyepiece is one of the most important and best corrected eyepieces. The most popular choice for high-powered astronomical viewing. It offers a tremendously wide, flat field; excellent correction (both spherical and chromatic); freedom from ghosts and scattered light; and greater eye relief than even the Kellner. These precision made Orthoscopic Eyepieces are of a four-element design with fluoride coated lenses. They have standard 1 1/4" outside diameter measurements. Chrome plated brass and aluminum mounts.

Effective Focal Length	Power given with 48" F. L. Objective	Stock Number	Price Ppd.
4mm	300 Power	30,364	\$14.50
6mm	200 Power	30,404	14.50
12.5mm	96 Power	30,405	14.50
18mm	67 Power	30,406	14.50
25mm	48 Power	30,407	14.50

KELLNER EYEPIECES



- Wide, flat fields
- Excellent correction
- Good eye relief
- Coated

These brand new, imported Kellners are eyepieces you'll be proud to own and show your astronomer friends. Excellent color correction. All have standard 1 1/4" outside diameter and 50° apparent field of view. Ample eye relief. Modern design features attractive chrome and black finish with easily visible markings.

Eyepiece	Focal Length	Eye Lens Diam.	Field Lens Diam.	No.	Price, Ppd.
(A)	9mm	5mm	7.5mm	60,492	\$9.75
(B)	12mm	7mm	8 mm	60,493	9.25
(C)	18mm	15mm	19 mm	60,494	9.00

20MM-F.L. ERFLE

- Excellent spherical and chromatic correction
- Very wide, flat field
- Excellent eye relief
- Coated lenses

An eyepiece you'll use more than any you own. Extremely wide 65° field of view and excellent correction of all aberrations.

This precision made, imported Erfle will give you good power for use with refractors, reflectors, rich field telescopes, finder scopes, spotting scopes, etc. Standard 1 1/4" outside diameter. Coated lenses, excellent eye relief. Diameter of eye lens 22mm, field lens 26mm. Streamlined, modern design with handsome chrome and black finish.

No. 60,495 \$24.00 Ppd.



WIDE ANGLE EYEPIECES we've long been famous for



(A) 28MM-F. L. KELLNER



(B) 38MM-F. L. ERFLE

For good, clear image quality you will find these fine, war surplus eyepieces hard to beat. Precision built to government specifications, they are of wide angle design which gives you a tremendous field of view. These eye-

pieces are terrific buys at the prices shown and cannot be repeated once our stocks are exhausted. They fill the need of many amateur astronomers who require a fine eyepiece at a low, bargain price... Buy now while available.

(A) 28MM-F. L. KELLNER IN STANDARD 1 1/4" MOUNT. This large field (50°) eyepiece with slightly over 1" focal length is best for normal telescope viewing. Big field lens and long eye relief make it very easy to find image. Same two achromatically corrected lenses used in quality military telescopes—put into new metal cell and extension of black anodized aluminum for 1 1/4"-diam. holders. Field lens 29.5mm in diam., eye lens 28mm.

No. 5223 \$9.95 Ppd.

(B) 38MM-F. L. ERFLE. Gives telescopes a big 65° field. Made for Govt. at cost of approx. \$100, it has 5-element lens system of Kodak's rare earth glass—extremely good aberration correction. Low-reflection coated. Has diopter scale and smooth focusing 3/8" movement. Clear aperture of eye lens 2", field lens 1 1/2". Mounting threads 3" O. D., 32 TPI.

No. 60,351 \$22.50 Ppd.

1 1/4" Adapter for above. **No. 50,358 \$3.95 Ppd.**

RAMSDENS—MOUNTED IN ALUMINUM BARRELS



Standard 1 1/4" outside diameter. We mounted two excellent quality, plano-convex lenses in black anodized aluminum barrels instead of chrome-plated brass to save you money, to kill reflections and to give a clear image. Directions included for using short focal length eyepieces.

6mm Focal Length. **No. 30,204 \$4.75 Ppd.**
12.7mm Focal Length. **No. 30,203 4.50 Ppd.**

As above, but 0.917" outside diameter. Type used in our own 3" telescope "The Space Conqueror."

6mm Focal Length. **No. 30,195 \$3.75 Ppd.**
12.7mm Focal Length. **No. 30,198 3.75 Ppd.**
25.4mm Focal Length. **No. 30,194 3.50 Ppd.**

With Etched-Glass Crossline Reticle. Similar to 25.4mm-F. L. eyepiece directly above O. D. 0.917".

No. 30,334 \$6.95 Ppd.

STANDARD EYEPIECE ADAPTER

Change your substandard eyepiece to standard size 1 1/4" O. D. Adapter is fastened with small set screw. I. D. 0.917". Black, anodized aluminum.

No. 30,199 \$1.95 Ppd.

RAMSDEN EYEPIECE SETS—UNMOUNTED

Sets contain two plano-convex or double-convex lenses. Mount them in a short length of tubing (see page 131) for eyepieces of various powers. Some lenses may have chipped edges or small scratches, but all are guaranteed to be perfectly usable. Spacing directions included.

No.	Approx. F. L.	Price Ppd.	No.	Approx. F. L.	Price Ppd.
30,208	6mm	\$1.75	5194	28.4mm	\$1.00
30,210	12.7mm	1.50	5195	25.4mm	1.00
5198	12.7mm	1.00	5193	31.4mm	1.00
5197	16mm	1.00	5192	35mm	1.00
5196	19mm	1.00	5191	38mm	1.00

BINOCULAR EYEPIECES IN FOCUSING MOUNTS

As used on M3 and M16 binoculars respectively.

22.5mm Focal Length. **No. 5201 \$4.50 Ppd.**
27.5mm Focal Length. **No. 5203 5.95 Ppd.**

25.4MM—F. L. WIDE ANGLE ERFLE EYEPIECE



This versatile eyepiece is particularly suited for use in low power telescopes, spotting scopes or binoculars. Lens has 5 elements... 2 achromats and a single positive. Optics made by B&L for wide-angle binocular. Black, anodized aluminum mount, 1 1/4" long x 1 3/4" in diameter.

No. 60,225 \$12.00 Postpaid

Unmounted lenses only, with spacing directions.

No. 60,214 \$6.00 Postpaid

19MM—F. L. SYMMETRICAL EYEPIECES



This fine eyepiece in standard 1 1/4"-diam. aluminum mount contains 2 coated achromatic lenses. Clear diameter of lenses 16mm.

No. 30,316 \$6.95 Ppd.

In 0.917"-diam. Mount. Similar to above, but with standard microscope size mount. Two coated achromats. Focal length 19mm.

No. 30,315 \$5.95 Ppd.

30MM—F. L. WIDE ANGLE KELLNER EYEPIECE



This \$29.00 eyepiece, from war surplus anti-aircraft scope, has two cemented achromats. Good for rich field and satellite scopes. Clear aperture of eye lens 1 3/8", field lens 1 1/4". O. D. of brass mount 2 1/8".

No. 60,144 \$9.50 Ppd.

6MM HUYGENIAN EYEPIECE

Terrific buy on best quality Japanese-made eyepiece. Mount is standard 1 1/4" O. D. chrome-plated brass. Directions for using short F. L. eyepiece included.

6mm Focal Length. **No. 30,063 \$5.00 Ppd.**

See Our Focusing Kellner Eyepiece... Page 132

DELUXE, FASTER, MORE ACCURATE STAR FINDER GIVES YOU SIDEREAL TIME



Multiply your pleasure in exploring the heavens. Not only the best constructed planisphere we've seen, but one that gives sidereal time—principal aid for exploring the heavens—accurate to within 2 minutes! Simply set your longitude, standard time and date to read sidereal time directly. Also shows the stars in the heavens at your location and their relation to each other at any selected day and hour; determines longitude; gives accurate solar time directly from the stars; illustrates motion.

Tops for casual observer or serious amateur with circle-equipped telescope (quickly pinpoints sky objects not visible to the naked eye).

Rigid plastic, 10" x 11 3/4", for years of hard use. Same material used in government charts, etc.—won't warp, markings won't rub off. Includes 90-page (8 1/2" x 11") book "Find the Stars" with instructions, 22 sky maps and information on over 250 celestial objects.

No. 70,815 \$9.95 Postpaid

ZOOM EYEPIECE

\$26.50

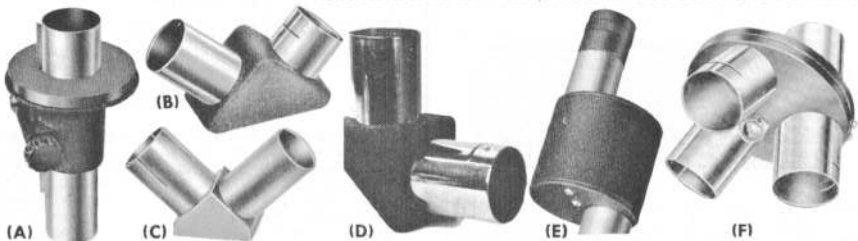
Ppd.



* Does the work of 3 or 4 eyepieces—eliminates lost time and refocusing
* True zoom . . . stays sharp at all powers

One of the handiest astronomy accessories to come along in years. Unlike pseudo "zoom" optics, this eyepiece needs to be focused only once; subject stays in focus whether you're at 8.4mm or 21mm focal length. Standard 1 1/4" O.D. Fully orthoscopic coated lenses give wide flat field. Excellent correction for both spherical and chromatic aberrations. To find the minimum and maximum magnification with your scope, divide objective focal length by 8.4mm and 21mm respectively. Typical magnifications are 50 to 120X (can be increased 2 to 3 times with Barlow). Excellent eyepiece for special laboratory instruments. **No. 60,362 \$26.50 Ppd.**

FOR REFRACTORS EYEPIECE MOUNTS, REVOLVING TURRET, STAR DIAGONALS, PRISM ERECTING SYSTEMS



(A) EYEPIECE MOUNTS

Smooth, trouble-free focusing will help you get professional performance. This mount has smooth rack and pinion focusing with variable tension adjustment. Tube accommodates standard 1 1/4" eyepieces and accessory equipment. Lightweight, aluminum body casting adds a minimum of extra weight to your telescope. Focusing tube and rack of chrome-plated brass, body finished in black wrinkle paint. Generous focus travel of 4 1/2" for viewing close or distant objects with any objective. Clear aperture 1 1/4".

No. 50,103 For Tubes 2 7/8" I.D. \$13.50 Ppd.
No. 50,108 For Tubes 3 7/8" I.D. \$14.50 Ppd.

(B) PRISM STAR DIAGONAL

For comfortable viewing of the stars, etc., at the Zenith position or high overhead on refractor telescopes using standard size 1 1/4" O. D. eyepieces. You can also make an adapter for substandard refractors.

Contains an excellent quality right-angle prism. Tubes are satin-chrome plated brass. Sturdily built, lightweight body is black, cast aluminum with wrinkle finish. Optical path of system measures approximately 3 1/2". Clear aperture of prism 7/8".

No. 70,077 \$12.00 Postpaid

(C) FIRST SURFACE MIRROR STAR DIAGONAL

A low priced accessory for comfortably viewing astronomical objects with reflecting telescopes. Can also be used on standard microscopes, as it is the correct size. Eyepiece end accepts eyepieces with O. D. of 0.917". Objective end fits into tubes with I. D. of 0.917". Made of plastic, contains a first surface mirror. Clear aperture 3/4".

No. 30,278 \$3.00 Postpaid

(D) AMICI PRISM ERECTING SYSTEM

Refractor telescope owners! Now you can have right angle viewing with an erect image. This is ideal for beginners viewing sky objects as image is correct from left to right and not inverted. Adds to your comfort when viewing terrestrial objects. Made for standard 1 1/4" outside diameter eyepieces. Attractive chrome and black wrinkle finish . . . sturdily built for long, hard use. Clear aperture of prism 7/8".

No. 50,247 \$12.00 Postpaid

(E) TELESCOPE PRISM ERECTING SYSTEM

This will give your refractor telescope an erect image when you want to use it for ground viewing instead of astronomical viewing. Discover the many fascinating terrestrial views you have been unaware of or simply neglecting. Consists of a porro-prism system similar to binocular erecting system. Fits all refractor telescopes taking standard 1 1/4" outside diameter eyepieces. Chrome plated, brass tubing and black-wrinkle cast aluminum housing. Optical length of system 8". Clear aperture 1 1/4".

No. 70,078 \$12.50 Ppd.

(F) REVOLVING TURRET FOR TELESCOPE EYEPIECES

No need to fumble in the dark for stray eyepieces. With this accessory you can "dial in" up to three different powers just by revolving the turret. Turret is equipped with an indent which positively and correctly positions each of the three eyepieces in the field of view. It accepts three eyepieces, standard 1 1/4" outside diameter, and will attach to refractor telescope having an eyepiece tube measuring 1 1/4" inside diameter. Made of aluminum and brass with chrome plated eyepiece tubes. Clear aperture 1 1/4".

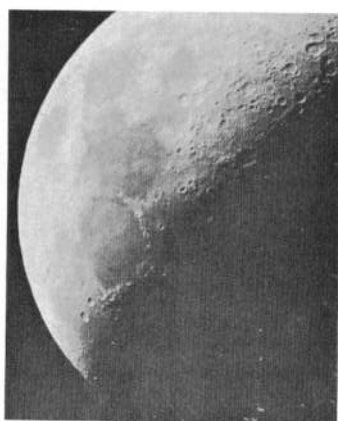
No. 50,355 \$14.50 Ppd.

ASTRONOMY - BARLOW LENSES

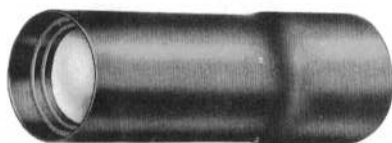


INSTEAD
OF THIS

SEE
THIS



We Strongly Recommend
**OUR COLOR-CORRECTED, TWO-
ELEMENT, MOUNTED BARLOW**



Don't fail to try this. You have no idea, until you have done so, how much more you will enjoy using your telescope with our color-corrected, two-element, mounted Barlow. Position of Barlow lens element can be changed in mount to vary power. It doubles or triples the power and provides increased eye relief—focal length is—46.6mm. Brass mount, gloss black outside, dull black inside, slides into 1 1/4" inside diam. draw tubes. It also accepts 1 1/4" standard eyepieces.

No. 40,477 \$8.00 Postpaid

Lens only from above, ready for mounting.

No. 30,448 \$3.00 Postpaid



BARLOWS FOR YOUR JAPANESE TELESCOPE

Mounted Barlow (.965" outside diam.). Instead of 60X, you get 120 to 180 power. Graphically the illustration at top of page shows approximately what you can accomplish. Mounted in two pieces of telescoping brass tubing, each 4" long. Satin-chrome plated finish. Standard size for most Japanese telescopes, but measure your eyepieces before ordering (.965" is approx. 31/32" or 24.5mm).

No. 30,370 \$6.00 Postpaid

Unmounted, 3-Power Barlows. Made for telescopes with smaller than standard diameter eyepieces. Mount between eyepiece and objective to triple power. Instructions included. Single element lenses, 1 1/4" F. L.

.912" diameter. **No. 30,328 \$2.50 Ppd.**

.932" diameter. **No. 30,185 3.50 Ppd.**

1.181" diameter. **No. 30,175 3.50 Ppd.**

3-POWER, ADJUSTABLE DIAMETER BARLOW

Prongs on mount can be opened or closed to fit eyepiece tubes with from 1 1/4" to 1" inside diameter. Installation directions included.

No. 30,339 \$5.00 Ppd.

BARLOW LENSES

**TO DOUBLE OR TRIPLE
YOUR TELESCOPE'S POWER**



A Barlow lens is designed to double or triple the magnification of a telescope with but a very slight increase in focal length. One of the most practical accessories you can buy. It eliminates the need for hard-to-use, short focal length eyepieces or long, cumbersome telescope tubes. By narrowing the cone of light, it often improves the performance of eyepieces . . . particularly those of Huygens or Ramsden type. It is a negative lens and is placed in the eyepiece tube.

*For Years the Pride and Joy of
Many, Many Serious Astronomers*

**ORIGINAL GOODWIN,
ACHROMATIC, COATED
BARLOW LENS**

Only \$23.50 Ppd.



Owing to the death of the owner of the famous company manufacturing this high quality optical lens it was not available for several years. We can now offer it made to the original specifications. Here is a Barlow lens that you can truly be proud to own, to show your friends.

The Goodwin Barlow consists of a cemented (two-element) achromat especially made for this use. It has an effective focal length of 44mm. (—1.73" or approximately —1 3/4"). The coated achromat is mounted in a cell held by spring tension inside a 4" long blackened adapter tube. The tube accepts standard 1 1/4" eyepieces.

The position of the achromat inside the tube is easily changed to fit the characteristics of individual telescopes . . . one of the important features of the Goodwin. This means you can use it with any telescope you may own in the future, or on a friend's telescope.

Remember, the Barlow is achromatic, coated, mounted in a blackened tube and is as optically perfect as only precision craftsmen can make it. Complete with instructions for using. **No. 60,122 \$23.50 Postpaid**



OBSERVING THE SUN

Simplest and safest method is SUN PROJECTION—see our camera holder and sun projection screen on page 141. Direct viewing is a trifle sharper, but care must be taken to protect the

eyes. For direct observation, use Herschel wedge with a sun filter over the eyepiece.

"Observing the Sun" booklet. **No. 9056 15c Ppd.**



Mounted Herschel Wedge. Fits holder No. 50,077 used on 4 1/4", 6" reflectors. 5"x3 1/2" rod is long enough for 4 1/4", 6" & 8" mirrors. Wedge angle —10°. Critical surface flat to 1/4 wave. 40x55mm.

No. 30,266 \$5.50 Ppd.

Unmounted Wedge.

No. 30,265 \$3.50 Ppd.

Sun Filters. Protect the eyes. Light transmission: visible .009%, ultraviolet none, infrared .0190%.

No. 2729 (1 1/4" round x 3mm thick) \$1.50 Ppd.

HIGH QUALITY REFRACTOR

Although most amateur astronomers prefer the reflector telescope, the refractor, too, has its ardent devotees. The initial cost of a refractor is usually three to four times that of a reflector; however, once purchased, it is very easy to use and maintain. Edmund Scientific offers many finished parts, including the fine mounted objectives listed here. These bargains will help you to lower the cost of building a refractor telescope.



YOU'LL BE PLEASED WITH THESE LENSES

ACHROMATIC OBJECTIVES

Because the objective lens is the heart of every refractor a good one is essential. These imported achromats are air spaced to give the lens system four surfaces (all have low reflection coatings) on which aberrations can be corrected. They produce clear, sharp, color-free images (to the C & F lines) and are also free from coma and spherical aberrations. Ideal for visual use, they are also excellent for photographic work provided a yellow filter is added. Each lens is mounted in a black metal cell with threaded retaining rings. Cells will fit our standard aluminum tubing.



Diameter	F. L.	No.	O. D.	I. D.	Price, Ppd.
3"	45"	50,162	3 1/8"	3"	\$42.95
4"	60"	70,128	4 1/8"	4"	89.00
5"	71"	*70,164	4"	5"	150.00

* Mounted in cell with 5 1/2" O.D., 6 1/2" flange. With adapter for mounting in 6 1/8" I.D. tubing.

UNMOUNTED, AIR-SPACED, ACHROMATIC OBJECTIVES

Diameter	Focal Length	Stock No.	Price, Ppd.
3"	45"	30,190	\$32.00
4"	60"	50,107	69.00
5"	71"	70,163	125.00
6"	90"	70,383	195.00

"Telescopes You Can Build" (No. 9065, 75¢ Ppd.) tells how to make Refractors and Reflectors using low-cost Edmund parts. Order book today.

NEW BOOK "TELESCOPES FOR SKYGAZING"

How to choose, test and use a telescope, how to assemble one yourself, what sky objects to set your sights on; plus astrophotography and binoculars in astronomy. By H. E. Paul. Hardbound, 160 pages (6" x 9") with over 225 illustrations.

No. 9375 \$4.95 Postpaid

LOW-COST, LONG F. L. ACHROMATIC LENS

Build a low-cost refracting telescope. The long 50" focal length of this lens will give you 100 power using a 1/2" focal length eyepiece. This 100X can even be increased by two to three times with the addition of one of our Barlow lenses listed on page 136. This is a 2" diameter, low-reflection coated, airspaced-type achromat. Plans for several telescopes you can make using this objective are in our new booklet "Telescopes You Can Build." See page 143. You can't buy a lens of this quality and focal length for twice our price.

No. 30,187 \$9.50 Postpaid

MOUNTED, WAR SURPLUS ACHROMAT

Mounted in brass cell with retaining ring. Clear aperture 35mm; F. L. 178mm. Used with eyepiece No. 30,194 (\$3.50) and mounted porro prism No. 50,187 (\$4.50) this quality achromatic lens makes excellent 7X terrestrial scope.

No. 40,429 \$1.50 Postpaid

LOW-COST ACHROMATIC OBJECTIVES MEET BEGINNERS' BUDGET

To solve the problem of good quality low-cost objectives for a beginner's telescope, we have had these achromatic lenses designed and mass produced. They are excellent! Diameter 32mm (1 1/4"), F. L. 31". You get 62X with 1/2", 124X with 1/4" eyepiece.

No. 30,201 \$3.50 Postpaid

Diameter 42mm (1 3/4"), focal length 41". You get 41X with 1" eyepiece; 82X with 1/2"; and 164X with 1/4".

Airspaced. No. 30,202 \$5.00 Postpaid

NEW "DICTIONARY OF ASTRONOMICAL TERMS"

For student, teacher, hobbyist.

Over 1700 comprehensive definitions of the important terms, theories, symbols and men in astronomy. Fully up-to-date, carefully cross-referenced. By Wallenquist. Paperbound, 265 pages (4 1/2" x 7") with 90 diagrams.

No. 9373 \$1.95 Ppd.

EDMUND STAR FINDER

EASY WAY TO EXPLORE THE FASCINATING SKIES



Any child or adult, whose interest has been whetted by outer space talk, will find this new Edmund star finder the happy, easy way to explore the sky. No previous knowledge of constellations, or even accurate knowledge of time, location or direction factors is necessary. With this attractive precision-made, metal instrument, any observer can quickly locate and identify any charted visible star.

It is just as easy to aim at an unknown star and identify it from the star map included as it is to locate a particular star on the star map first, and then in the sky.

No calculations, time signals or almanacs are needed. It has no blind spots. Any part of the sky can be examined. The view is erect, same size, same brightness.

The Star Finder has full adjustment for use anywhere in the U. S. A. or Canada. It will prove extremely useful to Power Squadrons, Boy and Girl Scout Groups, Schools, Amateur Astronomy Clubs. Persons with telescopes who have exhausted moon and planet views will find it a handy area localizer for double stars, clusters and nebula. It can also be used for study of elementary celestial navigation or surveying.

Two large, easy-to-read dials enable you to set the finder right on target according to the hour angle and the angle of declination. Overall size is 8" x 4" wide x 7 1/4" deep. Designed for use on any tripod or simple mount.

No. 70,501 \$9.00 Postpaid

FOLLOW STARS EASILY WITH EDMUND EQUATORIAL TELESCOPE MOUNTS

VALUE OF AN EQUATORIAL MOUNT

An equatorial mount makes it easy for you to follow stars, moon, planets as they move across the sky. It is equipped with both polar and declination axes at right angles to each other. You point the polar axis at the North Star and fix it there. The telescope is then moved about the declination axis to find the star or object you wish to follow. Slight rotation of your telescope on the polar axis will keep the object constantly in view as it moves across the heavens. Better still, add a clock drive to do the tracking for you.

SETTING CIRCLES SUPPLIED ON ALL MOUNTS

Finding objects in the sky is made so much easier with the fine setting circles included on all mounts on this page.

6" EQUATORIAL
MOUNT ON
PEDESTAL BASE



6" EQUATORIAL
MOUNT
ON TRIPOD



4 1/4" EQUATORIAL
MOUNT ON
PEDESTAL BASE



4 1/4" EQUATORIAL
MOUNT
ON TRIPOD



6" REFLECTOR EQUATORIAL MOUNTS (New Teflon Bearings) WITH AND WITHOUT CLOCK DRIVES

Same fine mounts with teflon bearings, setting circles and clock drives used on our 6" Reflector (page 124). Also excellent for 4" and smaller refractors. New. 2-axes balancing allows for additional equipment anywhere along scope.

- (A) Sturdy design to eliminate vibrations.
- (B) Precision teflon bearings for smooth operation.
- (C) Variable polar axis for altitude adjustment.
- (D) 12" cradle holds 3" to 10"-diameter tubes.
- (E) Big friction holding knobs on both declination and polar axes.
- (F) Pleasing gray wrinkle finish.
- (G) 30"-high Pedestal of heavy gage, 3" steel tubing, 3-toed base.
- (H) Tripods made from kiln dried hardwood.
- (I) Setting circles included.

Clock Drive, Heavy-Duty Mount, Pedestal.

No. 85,111 Shpg. wt. 48 lbs. \$94.50

Heavy-Duty Mount, Pedestal.

No. 85,108 Shpg. wt. 46 lbs. 45.00

For Refractors—Wooden Tripods

Heavy-Duty Mount, Clock Drive, 60" Tripod.

No. 85,082 Shpg. wt. 42 lbs. \$98.50

Heavy-Duty Mount, 60" Tripod.

No. 85,034 Shpg. wt. 40 lbs. 49.00

For Refractors—Wooden Tripods

Heavy-Duty Mount, 32" Tripod

No. 85,023 Shpg. wt. 36 lbs. \$39.50

SEE SLOW MOTION CONTROL KIT FOR DECLINATION AXIS—Pg. 139

4 1/4" REFLECTOR EQUATORIAL MOUNTS (New Teflon Bearings) WITH OR WITHOUT CLOCK DRIVE

Same fine drive and mount used on our 4 1/4" reflector. Excellent for up to 3" refractors. Clock drive is described on page 139. Mounted on the same sturdy pedestal base as our heavy-duty equatorial mount, or on 40" and 60" tripod legs, or without legs. While not as rugged as the heavy-duty above, you will find this unit will give you lots of pleasure by eliminating continual adjustment. Ideal for the amateur who wants a real clock drive, equatorial mount and sturdy pedestal base or tripod at a minimum cost. Setting circles incl.

Med.-Duty Mount, Clock Drive, Pedestal.

No. 85,112 Shpg. wt. 35 lbs. \$73.50

Med.-Duty Mount on Pedestal.

No. 85,109 Shpg. wt. 33 lbs. 24.00

Med.-Duty Mount, 40" Tripod.

No. 85,009 Shpg. wt. 18 lbs. 18.95

Med.-Duty Mount, 60" Tripod.

No. 85,015 Shpg. wt. 20 lbs. 22.50

8-INCH, EXTRA-HEAVY-DUTY EQUATORIAL MOUNT . . . SEE PAGE 125

IMPORTANT NOTE: TRANSPORTATION CHARGES COLLECT on all items listed on this page.

Track Stars Effortlessly!

IMPROVED ELECTRIC CLOCK DRIVE

- New Slow Motion Control—sensitive, manual compensating lever for more precise tracking with or without electricity; plus better photos
- New Quick Clutch—balance scope in seconds
- More accurate—properly mounted on polar shaft only
- Accepts low-cost, clock driven setting circle
- High quality 1/15 RPM motor



Ideal for group viewing, star parties, astrophotography. Once a star is located, the drive takes over and keeps it in the field for any normal viewing period.

New SLOW MOTION CONTROL corrects for even the minute variation (less than 4 min./day) of the clock itself from true sidereal time. Lever operates sensitive cam which moves whole clock assembly and adds cam's correction to uniform drive rate of clock.

New friction-type QUICK CLUTCH releases quickly with thumb screws for initial balancing only. Clutch then allows you to move scope quickly without damaging drive. Motor and large 3" pitch diameter, 96-tooth, hardened aluminum gear and ground and polished steel worm give smooth performance with great torque. Factory assembled for precision, easily installed in minutes.

Same drive supplied with mounts on opposite page. Adaptable to almost any mount by fitting to polar shaft. Supplied with housing clamp with either 1" or 1½" hole (this clamp with pin takes the reaction to the drive and serves also as the slow motion compensator). Operates on 110-volt, 60-cycle AC current. Instructions included.

Clock Drive (fits 5/8" shaft and 1" housing). May be bored out to fit shafts from 5/8" to 1". Fits our telescope mounts Nos.: 85,105; 85,009; 85,109; 85,015; 70,257.
No. 70,726 \$49.50 Ppd.

Clock Drive (fits 1" shaft and 1½" housing). Fits our telescope mounts Nos.: 85,034; 85,108; 85,084; 85,023.
No. 70,725 \$49.50 Ppd.

Clock Drive (bored to fit polar shaft of later model Edmund 8" telescope mounts with shaft end turned down to 1" O.D.)
No. 70,788 \$62.50 Ppd.

NEW! CLOCK-DRIVEN RIGHT ASCENSION CIRCLE. Mounts directly on clock drives 70,725; 70,726; 70,788 to provide sidereal time and eliminate calculation of star positions. Stays true to moving star pattern without your having to correct it. Black phenolic circle, 5¼" in diam., with pointer and mounting hardware. Hour and degree scales. 1½" center hole. **No. 60,569 \$9.00 Ppd.**

NEW! MANUAL SLOW MOTION CONTROL KIT FOR DECLINATION AXIS. Gives you direct and total correction for astrophotography or when high-powered eyepieces are used—allows you to find and hold a star within any desired 4° to 5° declination. Functions similarly to slow motion control on clock drive. Includes declination shaft block with eccentric pin and manual tracking compensating lever. Fits 6" reflector 85,086; 4" refractor 85,087 and heavy duty mounts 85,082 and 85,081 (pg. 138) or homemade mounts with 1" shaft and 1½" declination shaft housing. Black and cadmium-finished aluminum, 3½" x 2" x 2½". Directions incl. **No. 60,574 \$18.00 Ppd.**

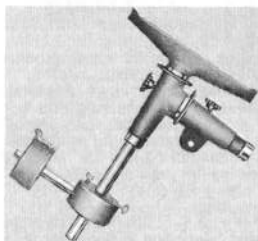
MOTOR FOR CLOCK DRIVE. Synchronous-type electric motor operates on 110-V, AC, 60 cycle. Output shaft rotates counter-clockwise at 1/15 RPM. Output torque 60 in.-oz. ¾"-diam. shaft, 2¼" long. Two mounting holds. 6" leads. Overall size (excluding shaft) 2¼" x 1¾" x 2¾". **No. 50,199 \$7.50 Ppd.**

MATCHING WORM AND WHEEL SET. When used with electric motor your telescope will follow the stars. 3" pitch diameter, 32 pitch, 96 teeth, ¾" face, .375" diam. bore. Plain, solid brass gear. No hubs or webs on wheel. Steel worm has .1875" diam. bore. **No. 30,307 \$12.00 Ppd.**



OPERATE CLOCK DRIVE ANYWHERE
This small inverter supplies 110V, 60 cycle electricity from your car battery. Can also be used to operate electric shaver. 15 watt rating. Size 2½"x2½"x4". Weight 2 lbs. For 12-V battery only.
No. 50,346 \$15.95 Ppd.

EQUATORIAL MOUNTS ONLY—6" & 4¼" Scopes



Same mounts sold on opposite page, but without tripod or pedestal. 6" scope has new 2-axis balancing system. Complete with setting circles.

For 6" Telescopes. Heavy duty. With clock drive. **No. 85,083 Shpg. wt. 32 lbs. \$84.00 T.C.C.**

Without drive. **No. 85,084 Shpg. wt. 34 lbs. \$34.50 T.C.C.**

For 4¼" Telescopes. Medium duty. Without drive. **No. 70,257 Shpg. wt. 14 lbs. \$17.50 T.C.C.**

Post Cap. For mounts above. **No. 40,771 \$4.00 Ppd.**

For 6", heavy duty mount. **No. 40,772 \$4.00 Ppd.**

For 4¼", medium duty mount.

PEDESTALS ONLY—For 6" & 4¼" Scopes

Sturdy, three-toed, 24"-high pedestal base for Heavy Duty Mounts No. 85,084; 85,083. Mounts bolt to ¾" hole in top cap (can be enlarged to accept other mounts). Heavy-gage, steel tubing; gray wrinkle finish (see illustration on pg. 124). **Transportation Charges Coll.**

No. 85,142 Fits our 6". Shpg. wt. 16 lbs. **\$14.50**

No. 85,122 Fits our 4¼". Shpg. wt. 16 lbs. **\$13.50**

Set of three toes only. **No. 70,693 \$9.95 Ppd.**

ASTRONOMY - ACCESSORIES

NEW! 135 STARS THAT GLOW IN THE DARK

Amateur astronomers and space enthusiasts, . . . transform your den or bedroom into a realistic night sky. Schools too can set up authentic sky scenes showing constellations and planets, and use them to illustrate lectures. Ideal holiday decorations, equally attractive for child's room. A canopy of stars will make them welcome rather than fight "lights out." Made of safe, non-radioactive phosphorus, they glow brightly after exposure to bright light.



This new larger set contains over 135 individual stars in assorted sizes from $\frac{1}{4}$ " to $\frac{1}{2}$ " in diam., plus the moon and saturn. All on two $10" \times 13"$ decal transfer sheets; simply moisten sheets and slide stars off into position desired. Star chart included for realistic placement of constellations. **No. 60,606 \$2.25 Ppd.**
Smaller Set of 125 stars, most $\frac{3}{4}$ " to $1"$ in diameter. With star chart. **No. 9298 \$1.00 Ppd.**

EXPLORE THE MAKEUP OF THE STARS WITH EDMUND'S STAR SPECTROSCOPE



Consider star spectroscopy. The spectrum derived from the star's light can be used to determine the star's temperature, its chemical composition, speed of rotation. The Edmund Star Spectroscope can introduce you to this fascinating subject. It is designed for visual spectroscopy and has three cylindrical lenses, one each for first, second and third magnitude stars. It consists of a train of five prisms of crown and flint glass, plus lenses. Fits standard $1\frac{1}{4}"$ telescope eyepieces.

No. 50,023 \$45.00 Ppd.



NEW NOVA HOME PLANETARIUM

Now With Full Line of Projection Accessories
 The Toy That Brings Outer Space Indoors!

Boys and girls love this fun-filled, educational astronomy aid. Provides hours and hours of exciting study by projecting over 60 constellations and hundreds of stars on the walls and ceiling of any dark room in the house. Operates on regular household current. Two simple adjustments take you into any month of the year at any place in the Northern Hemisphere. You rotate the sphere by hand to demonstrate daily movement of stars.

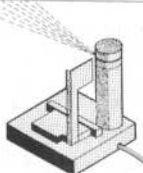
Plastic planetarium stands about $14"$ high and has a $7" \times 7"$ base. Built-in rheostat permits control of brightness. With all these accessories: arrow projection pointer; projector with 12 slides of constellations that can be silhouetted over stars; 13 blank slides to make your own silhouettes; projector to simulate 6 solar and lunar eclipses; 16mm film strip projector with 4 thrilling shows (over 150 pictures) including "Trip to the Moon"; power pack with rheostat for accessories. Complete 32-pg. instruction booklet.

No. 70,679 \$30.00 Ppd.



UNIVERSAL PLANETARIUM PERFECT FOR TEACHING RELATIONSHIPS OF SUN, EARTH, AND MOON

Here is a versatile, compact instrument designed to teach many space-age facts. Demonstrates day and night, seasons, length of day and phases of the moon. A $6"$ diameter sun, the earth and moon are supported on a handsomely finished wood base, while a gear and chain drive orients the earth. Size $12"$ high, $8"$ wide, $18"$ long. Illustrated handbook. **No. 70,415 \$29.95 Ppd.**



NEW! FOUCAULT TESTER KIT

Now, you can easily assemble your own Foucault knife-edge tester with this inexpensive kit. When completed, use it to test spherical mirrors, for parabolizing mirrors, checking effects of different mirror-polishing strokes, etc. We use one in our laboratory. Kit includes every part you need: 7.5-watt bulb and socket, knife-edge, wire, cord and plug, slide, $5" \times 5"$ wooden base, $6"$ column, cap, spacer, hardware and complete assembly and usage instructions.

No. 70,977 \$5.95 Ppd.

PANORAMIC CAMERA OBSCURA LENS 12 FT. F.L., $5"$ DIAM. PCX

You've probably heard of the famous camera obscura in Santa Monica, Cal. or read H. E. Dall's account (in Amateur Telescope Making, Book II) of the fun he had with his. He saw beautiful panoramas, vivid sunsets, projected written messages and a microscope slide of a flea that appeared 4 ft. high one mile away. You can build one by mounting our camera obscura lens in a rotating tube with mirror above in an attic or garage roof. Rotating the tube projects a colorful panorama that's more vivid than when viewed directly. Includes usage and mounting instructions.

No. 98,005 \$15.00 Postpaid

6 GIANT EARTH & SPACE MAPS Only \$2.25 Ppd.



Attractive wall decoration for child's room, recreation room, den or study. Extremely educational.

1. Outer Space, $35" \times 48"$. Full color. Bold presentation showing the relationships of our space neighbors.
2. Solar System, $34" \times 48"$. Yellow and black. Includes dramatic photos plus $13"$ -diameter detailed moon map.
3. World Star Chart (illustrated), $29" \times 41"$. Blue and white. Brings real meaning to youth's studies.
4. United States, $35" \times 49"$. Full color.
5. World, $35" \times 49"$. Full color.
6. 5,000-Year History of Man — 3,000 B. C. to present, $35" \times 48"$. Full color. Lists important historic events and the date of their occurrence. Illustrates costumes, weapons, tools, inventions, transportation, art and architecture of each period.

Complete set.

No. P-9366 \$2.25 Ppd.



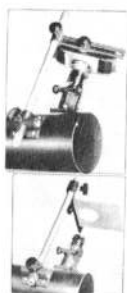
NEW! "PHOTOGRAPHY WITH YOUR TELESCOPE" by Sam Brown

This all new 36-page book shows you in easy text and clear illustrations how to take exciting photos of moon, planets and stars; long distance shots of birds, animals, etc. through the "big eye" of your telescope. The possibilities are endless. Photo of telephone pole (inset above) was taken with a roll film camera and 4 1/4" reflector telescope. Pole was 300 yards away!

Start shooting today with the big eye of your telescope. Whereas regular telephoto systems average only 2X to 3X... with your telescope you choose the power! Book covers: The Refractor and Reflector as Cameras, Using Photographic Optics, Mounting Camera, Auxiliary Lenses, etc., etc.; plus tables on spacing, image sizes, fields and more. 36 pages (8 1/2" x 11").

No. 9078 Only 75c Ppd.

CAMERA HOLDER & SUN SCREEN FOR SCOPE



With this set you utilize your telescope and its eyepieces plus your own camera to take exciting photos. The set includes a bracket which permanently bolts to the telescope. Whenever you wish to take pictures attach the rod and camera holder. The latter, adjustable on the rod, has a standard 1/4", 20-thread fitting. This screws into the tripod receptacle on your camera. Made of light weight aluminum with attractive black wrinkle finish. Rod is 28 3/4" long. Sun projection screen included attaches to the rod. Place it behind the eyepiece, point scope at sun and move screen to focus. See sunspots projected clearly on screen.

No. 70,162 \$9.95 Ppd.

STAR GAZING WITH TELESCOPE AND CAMERA

By George T. Keene. All the necessary information for photographing space objects. Includes dozens of photographs and drawings. Written for the beginner with a box camera or the owner of a large motor-driven telescope. Also how to find celestial objects, how to select telescopes and binoculars, how to make a reflector, etc. Author is President of the Rochester Academy of Science and a well known lecturer on astronomy. Paperback, 4 7/8" x 7 3/4", 128 pages.

No. 9350 \$1.95 Ppd.

ALL ABOUT TELEPHOTO LENSES by Sam Brown.

No. 9036 65c Postpaid. See page 107.

TELESCOPE AND CAMERA "T" ADAPTERS

(A) For astrophoto*. Use your 35mm. S.L.R., this Telescope Adapter and correct Camera "T" Adapter listed below. Lightweight aluminum body has black anodized interior to prevent undesirable reflections. Metric thread connects one end to Camera "T" Adapter. The other end has a parallel shank 1 1/8" long x 1 1/4" O.D. which fits inside of standard "eyepiece tube. Telescope Adapter measures 1 3/4" across shoulder, 1 1/2" overall.

No. 40,975 \$6.50 Postpaid

*Not all Japanese telescopes have eyepiece tubes measuring 1 1/4" I.D.

(B) Camera Adapters. "T" compatible. Connect SLR cameras as listed to Telescope Adapter above.

Camera	Praktika	Exakta	Miranda	Minolta	Nikon
Stock No.	40,960	40,959	40,958	40,957	40,956
Price, Ppd.	\$3.00	\$5.00	\$3.00	\$5.00	\$5.75

NEW CAMERA BODY FOR PHOTOGRAPHING STARS AND PLANETS



- Complete with adapters for direct hook-up
- Unique, two-motion shutter release for maximum sharpness
- Excellent for general picture taking too

This 35mm single lens reflex camera body appears to be the best and most practical camera body available for amateur astrophotography. Ideally suited for prime-focus use with Edmund reflector and refractor telescopes as well as most other makes. "T"-compatible adapter locks securely into bayonet-type lens mount of camera body; second adapter, manufactured by us especially for this application, screws into first and has 1 1/4"-O.D. for direct hook-up to all standard telescope eyepiece holders. Both adapters included.

Rugged and simple to operate, includes the features most wanted by astrophotographers; focal plane shutter; waistlevel finder with conventional groundglass focusing; fully removable back; selftimer. One knob winds film, sets shutter speeds and resets mirror. Shutter speeds are: bulb, 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/75, 1/100, 1/200, 1/500 and 1/1000 second; all in-between speeds may be set. Unique design of shutter release allows maximum sharpness through vibration-free exposure. By applying pressure slowly to release, mirror and shutter can be activated in two separate and distinct motions. Vibrations can actually be made to leave the camera before shutter goes off! An excellent camera for general picture taking too—full line of lenses and accessories available through regular photographic sources. Includes X and F flash synchronization and direct optical viewfinder for working under extremely poor light.

No. 70,857 \$79.00 Ppd.

For rigid mounting, use Camera Holder at left above. Order Book No. 9078 at top of page.

EDMUND MINI-MOON



**Many thousands of formations to study
Gift of gifts for an astronomer friend**

Unique decoration for room, library or display area, this bluish gray, three-dimensional model is an exact replica in relief as seen through a telescope. Perfect outer space conversation piece for the home. Study various features of the Moon . . . from 2-million-square-mile Ocean of Storms to craters such as Aristarchus, 29 miles in size. All proper surface size and distance relationships. Principal peaks rise $\frac{1}{8}$ " from surface.

Doubly valuable as a teaching aid. With proper rotation and lighting, you can show moon phases. Molded of tough, washable plastic in three colors . . . 12" in diam. Can be marked to emphasize areas and formations without damage. Slight reinforcing ridge at equator line gives additional strength. Reverse is blank, and you can use it to indicate information on new and future moon photos. Attractive, hand-spun aluminum base. Wt. approx. $\frac{3}{4}$ lb.

No. 70,515 \$12.50 Postpaid

BIG 48 $\frac{1}{2}$ " x 53 $\frac{1}{2}$ " 3-D OFFICIAL MOON MAP

Here is the most detailed map of the moon ever printed. Over 2000 names of oceans, seas, mountains, craters, peaks, etc. Separate index to every physical feature named. Gives elevation of mountains and depth of craters. Special four-color printing gives 3D effect.

No. 9380 \$1.95 Postpaid

35" x 46" PHOTO-REPRODUCED MOON MAP

Edmund Scientific Co. strongly recommends this big photographic reproduction of the full moon. This very

helpful aid is printed in black and white and has all named lunar formations clearly marked. Gives a complete index to their locations and includes other valuable information on the moon.

No. 9297 95c Ppd.



ROTATING STAR & PLANET FINDER, 8 $\frac{1}{2}$ " x 8 $\frac{1}{2}$ "

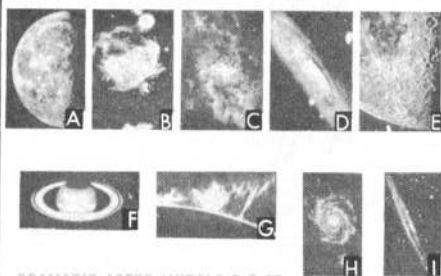
A "roadmap" of the heavens! This rotating chart shows over 500 stars in the heavens and their relationships to each other at any selected day and hour. By simply turning the disc until date and time are set, the positions of the stars on the chart will match the positions of the stars in the sky. A marvelous aid to observing the great parade in the heavens. Reverse side contains astronomical facts. Free with your Chart is a valuable illustrated booklet, "Star Paths" which shows you how to use it most effectively. Includes easily understood, simplified drawings of celestial sphere, key points on meridian, time correction tables, how to find planets, etc. "Star Paths" booklet has 16 pages, 4"x5 $\frac{1}{4}$ ". Complete set, Chart and "Star Paths."

No. 9227 50c Ppd.

Charts also available in quantities. "Write for details."

Make Your Own Star Charts. Cut and fold these accurate 11" x 17" star maps into working star charts. Package of 25.

No. P-9061 \$1.00 Ppd.



DRAMATIC ASTRO MURALS 2x3 FT. YOUR CHOICE \$6.00 POSTPAID

These 2 ft. x 3 ft. murals are exact, black and white reproductions of famous sky phenomena. Their wealth of detail is amazing. Prints are reproduced on fine paper by the Collotype process . . . no screen to spoil the photo effect. Frame several to give your room an astronomical atmosphere. Ideal decorations for home, school or institutions. Astro murals are endorsed by many leading, professional astronomers.

(A) Moon, Last Quarter, No. 70,243; (B) Great Nebula in Orion, No. 70,244; (C) Spiral Nebula in Triangulum, No. 70,245; (D) Great Nebula in Andromeda, No. 70,246; (E) Southern Sector of Moon, No. 70,248; (F) Saturn, No. 70,247; (G) Solar Prominence, No. 70,249; (H) Spiral Nebula in Canes Venatici, No. 70,251; (I) Spiral Nebula in Andromeda Edge on View, No. 70,250; Moon, 14 Days (NOT ILLUSTRATED), No. 70,252.

Any one (please specify).

\$6.00 ea., Ppd.

FULL COLOR ASTRO MURALS

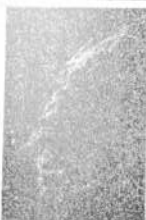
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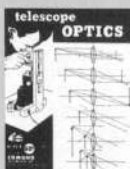
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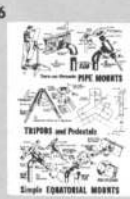


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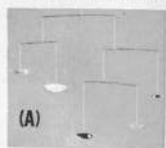
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LATE, LAST MINUTE ITEMS

3 NEW MOBILES FOR MODERN DECORATIONS

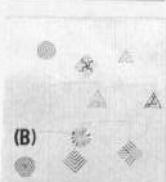
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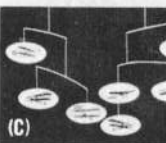
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Very popular model for boys' rooms. 7 different, antique airplanes. Movement seems to make them fly and turn.

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No. P-41,005 \$1.00 Ppd.

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IS THE LIGHTING ADEQUATE FOR YOUR WORK? CHECK IT

With this new illumination meter you can measure in foot candles the amount of light falling on yours and your employees' desks, the general illumination in such critical areas as assembly, inspection, etc. Check lighting at home study areas, kitchen, den, living room, etc. Teachers can

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Attractive desk-top addition and conversation piece, excellent gift. Made of lustrous, high-density black plastic with gold-finished metal trim and nameplate for engraving. Bottom of base has application chart showing lighting requirements in typical situations. Instructions included. No. 60,580 \$9.75 Ppd.

LARGE 20" X 24"

COLOR FILTER SHEETS

44 Colors

To Choose From



Create unique color effects with this wide range of 44 colors. Inexpensive, only \$2.00 each. Use singly or in various combinations to produce striking color variations. Indispensable for studio photographers, store and window displays, amateur theatricals, classroom art, colored lighting effects for home, garden, patio or pool. Easily cut with scissors to any size or shape. Moisture proof, heat resistant, cellulose acetate 0.01" thick. Listed below are the 44 colors available.

No.	Color	No.	Color
82,001	Bas Amber	82,028	Med. Lavender
82,011	Dark Amber	82,027	Special Lavender
82,010	Gold Amber	82,005	Dark Lemon
82,009	Light Amber	82,004	Medium Lemon
82,013	Orange Amber	82,024	Dark Magenta
82,007	No Color Amber	82,023	Medium Magenta
82,032	Azure Blue	82,012	Orange
82,039	Dark Urban Blue	82,017	Flesh Pink
82,031	Daylight Blue	82,018	Follies Pink
82,036	Greenish Blue	82,019	Medium Pink
82,033	Light Blue	82,022	Med. Salmon Pink
82,035	L. Greenish Blue	82,016	No Color Pink
82,034	Medium Blue (dark)	82,020	Rose Pink
82,038	Medium Blue (light)	82,021	Salmon Pink
82,030	No Color Blue	82,026	Surprise Pink
82,037	Surprise Blue	82,029	Medium Purple
82,008	Flame	82,025	Rose Purple
82,000	Frost	82,014	Light Red
82,040	Light Green	82,015	Medium Red
82,041	Medium Green	82,006	Straw
82,042	Med. Bluish Green	82,003	Light Straw
82,043	Yellow Green	82,002	No Color Straw

Each filter measures 20" x 24" and is priced at \$2.00 Ppd. See other color filter listings on pages 2 & 86.

6 RULES TO FOLLOW FOR ACCURACY

You'll find at least one, if not more, of the following rules perfect for use in your shop, office, school, home, etc. easy to handle. Made of lightweight hard aluminum that keeps its edge and doesn't rust. Accurate, legible markings reduce chance of error. Each has hole for easy hanging.



48" RULES READING LEFT-TO-RIGHT AND RIGHT-TO-LEFT. Perfect for shop and layout work, architects, builders, etc. Mount on equipment. Hundreds of applications. White scales on black, anodized background. Numbered every inch, graduated every 1/16". 1" wide x 1/10" thick x 48" long.

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No. 80,107 \$7.50 Postpaid

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24" CENTERING RULE. Marked 0"-12", 12"-0" with 1/32" graduations. Second scale 0" to 24", graduated every 1/16".

No. 60,658 \$2.50 Ppd.

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No. 80,104 \$5.50 Ppd.

45" METRIC-INCH RULE. Has two scales marked in black, 0"-45" numbered each inch, graduated every 1/16". Second scale 61 cm., numbered each cm. graduated in mm.

No. 80,105 \$4.50 Ppd.

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GIANT WEATHER BALLOONS



"Balls of fun" for all ages. These huge 8 ft. and 16 ft. weather balloons are great for games... in the backyard, pools, etc. Create a neighborhood sensation. Unsurpassed for outdoor display. Gets your advertisement up in the air where it is seen and remembered. Excellent traffic stoppers. Attract crowds for special sales, grand openings, church fairs, political rallies, fund raising drives and other special events. Perfect for amateur meteorologists for measuring cloud heights, humidity at various temperatures and experiments involving temperature, pressure and velocity. Photographers send cameras aloft for aerial shots.

Made from sturdy neoprene. These balloons are designed for weather experiments and are not to be confused with bag-like balloons of rubberized fabrics which sell for \$250.00 or more. Inflate with vacuum cleaner, air pump or helium (for aerial

uses). Suggested various applications and complete inflation instructions included.

8 Ft. size. No. 60,568 \$2.00 Ppd.

16 Ft. size. No. 60,632 \$7.00 Ppd.

See large, 4" diam. colorful beach balls of tough vinyl built for beach and playground fun, page 6

CHEMICAL LIGHT KIT CREATES INSTANT LIGHT

Operates on same chemiluminescent principles as glow worms and phosphorescent fish. Light is produced by the reaction of oxygen in the air and an active chemical ingredient. Designed originally for emergency use as



markers for downed pilots, stranded outdoorsmen and boatmen, it provides an instant green glowing light in dark areas without electricity, heat or flame. Temporarily mark trails, targets, edges of steps and doorways, for night parties, games, etc. Write messages. Turn light on or off by controlling air exposure. Lasts from 15 minutes to 4 hours depending upon amount of active material used and surface area exposed to air. Operates best at 0°F-100°F. Extended shelf life when sealed. Kit includes the active chemical ingredient in 5 forms: liquid, powder, tube of gel, chemical panel and snowflakes; plus complete instructions. Caution, avoid contact with skin or eyes. Keep away from small children.

No. 60,647 \$5.00 Ppd.

NEW! CASTING AND EMBEDDING KIT

Embed shells, coins, jewelry, leaves, biological and botanical specimens, pictures, desk pen holders, etc. Create beautiful and unusual shapes and designs. No mess. Add hardener. The resin gels, hardens and becomes crystal clear and smooth. Objects are permanently embedded and preserved. No heat necessary. Molds are provided, but you can use containers of any shape. Kit includes 1 pint casting resin, 2 circular plastic molds, hardener, mold releaser, 3 mixing cups, stirring sticks, ball point pen and holder, two colorful fishing flies. Instructions.



No. 70,896 \$5.50 Ppd.

CASTING RESIN AND HARDENER

Kit replacements, 1 pint liquid casting resin and 1 oz. of hardener.

No. 60,646 \$2.50 Ppd.

DYE PACK ASSORTMENT. Eight 1/4 oz. bottles: pink, red, blue, yellow, green, purple, orange and pearl. Colors mix to produce others. No. 40,999 \$2.00 Ppd.

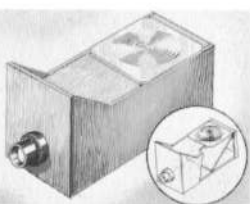
SEE PEOPLE, ACTION, PANORAMAS IN COLOR... DRAW LANDSCAPES & PORTRAITS EASILY ON CAMERA OBSCURA SCREEN

Use a camera obscura to watch children playing outside; observe birds, animals, your neighbors or passersby while remaining in the comfort of your home. Edmund's easy-to-build Camera Obscura Kit also helps you to become an accomplished artist in no time. Landscapes, seascapes, still-life objects, portraits; all can be accurately drawn with it right in your own living room. Just point the lens at the window or object you wish to paint or draw. Focus the image sharply on large, brilliant, 12" x 12" Fresnel screen (image is reversed but not inverted). Trace outlines and details, add color and you'll have a completed picture, in correct proportion, that you'll be proud of.

Kit contains 3 3/4" diam. 22 1/2" F.L. plano-convex lens, lens tube, focusing sleeve, special 12" x 12", 8 3/4" F.L., plastic Fresnel diffusion screen (cut corners) and complete instructions for building. All you need to complete your project is some lumber or cardboard, and an inexpensive mirror from a 5¢ and 10¢ store.

No. 70,881 \$10.50 Ppd.

CAMERA OBSCURA ECONOMY KIT—Same kit as above, but a flexible translucent plastic screen is used in place of the Fresnel. Flexible screen requires additional support of glass or plastic sheet so you can draw and trace on it. Unit works well, but not as bright as No. 70,881.



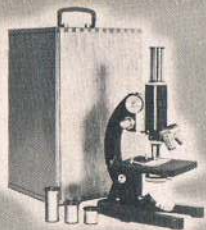
No. 70,882 \$4.00 Ppd.

FLEXILIGHT ILLUMINATES INACCESSIBLE AREAS... AROUND CORNERS, THROUGH HOLES, etc.



"Pipe" light into inaccessible places. Two foot long, flexible plastic light guide snakes in and around corners, through small holes, lights areas hidden in shadows and unlit by regular flashlights. A must for TV, radio and appliance repairmen; electricians; mechanics; hobbyists; etc. Light, from the penlight, travels along the 2 foot length of vinyl cased, 64 plastic fiber light guide to any point where the end is aimed. Light guide measures .130" O.D., minimum bending radius 3/4", has .004 sq. in. of light surface. Unit includes chrome finish 5 1/2" long x 5/8" diam. rotary switch penlight, bulb, rubber centering guide (for fiber light guide), rubber adapter and complete instructions. Batteries not included. Weighs 5 oz. Flexilight is easily converted to a regular penlight by removing the adapter.

No. 60,648 \$2.75 Ppd.



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